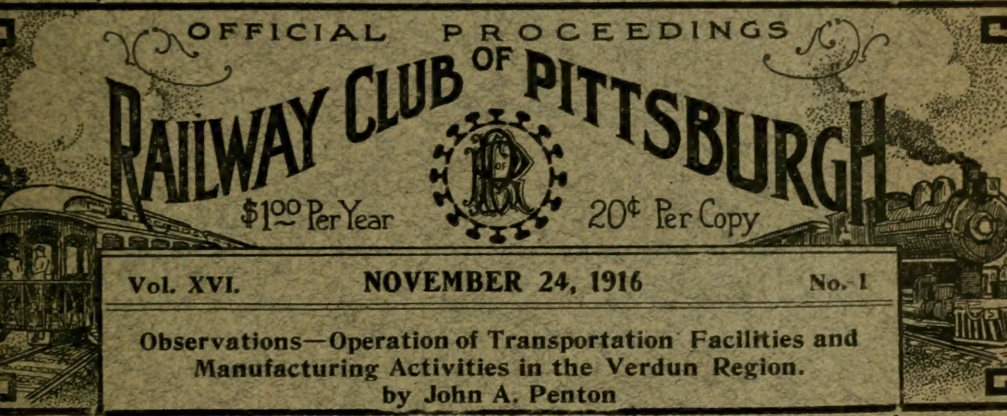
1895
CARNEGIE LIBRARY
PITTSBURGH

PRESENTED BY

PUBLISHER

BRADY BRASS CO.
MANUFACTURERS OF
CYPRUS BRONZE FOR LOCOMOTIVE and CAR BEARING USE
ENGINE CASTINGS BABBITT METALS
JOURNAL BEARINGS MOTOR BEARINGS
General Office and Works, 170-182 Fourteenth St. and 169-175 Fifteenth St., Jersey City, N. J.
DANIEL M. BRADY, President

SCHMIDT SUPERHEATER LOCOMOTIVES
Make firing easier Save coal and water
Haul longer trains Maintain faster schedules
LOCOMOTIVE SUPERHEATER COMPANY
30 Church St., New York. Peoples Gas Bldg., Chicago.



OFFICIAL PROCEEDINGS
RAILWAY CLUB OF PITTSBURGH
$1.00 Per Year 20¢ Per Copy

Vol. XVI. NOVEMBER 24, 1916 No. 1

Observations—Operation of Transportation Facilities and Manufacturing Activities in the Verdun Region.

by John A. Penton

Heavy Drop Forgings
STEEL CAR FORGE COMPANY
"FORGING SPECIALISTS"
PITTSBURGH NEW YORK CHICAGO

9741

FOR SALE

ARISTOS
"COPPERWELD"
Electrical Uses
Mechanical Uses
A COPPER CLAD STEEL WIRE
Product of the COPPER CLAD STEEL CO., Pittsburgh, Pa.
Drawn and Sold Exclusively by
PAGE WOVEN WIRE FENCE CO., - - Monessen, Pa.

FOR SALE

TORCHES

Gem Torches Save You Money

Exhaustive tests by largest railway systems have proven that Gem Brazed Seam Torches do save money. Let us prove it. Send for free sample and information.

Gem Manufacturing Company
PITTSBURGH, PA.

Graham Nut Company
PITTSBURGH, PA.

MANUFACTURERS OF

Hot Pressed Nuts, Cold Punched C. & T. Nuts
Bolts, Lag Screws, Washers, Etc.

This Space For Sale

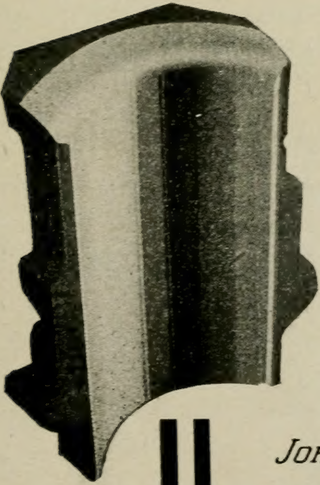
Better Bearings

Made by anti-friction specialists in a specially equipped plant with exceptional shipping facilities.

JOHNSON

Car and Locomotive Bearings

No matter whether you do or don't make your own, we believe we can furnish you with some interesting data.



Learn now whether you are paying too much for this item.

Send specifications and blue print today for our quotation

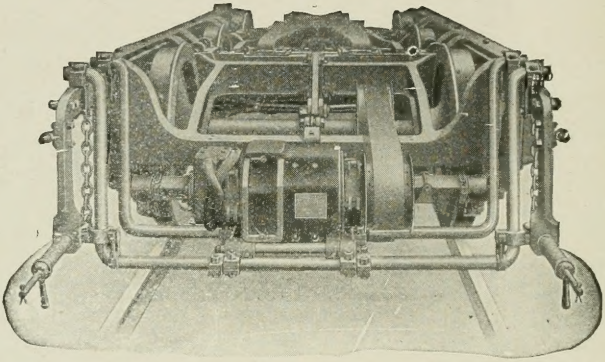
JOHNSON BRONZE COMPANY

Formerly The American Car & Ship Hdw. Mfg. Co.
Gen. Offices and Works New Castle, Pa.
SALES OFFICES
Buffalo Cleveland Cincinnati Detroit Chicago

Central Adult
cop.

THE GOULD "SIMPLEX" SYSTEM OF

ELECTRIC CAR LIGHTING

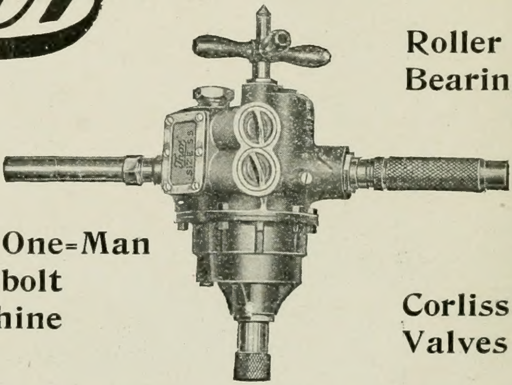


GOULD COUPLER CO.

NEW YORK

Thor

Roller-Bearing Compound
Piston Air Drills



Roller
Bearings

Size
SS

The One-Man
Staybolt
Machine

Corliss
Valves

FURNISHED ON TRIAL FREE. WRITE NEAREST BRANCH

INDEPENDENT PNEUMATIC TOOL COMPANY

Chicago : New York : Pittsburgh : Detroit : San Francisco : Birmingham : Montreal, Que.

MANNING, MAXWELL & MOORE,

ROBT. A. BOLE, MANAGER, PITTSBURGH BRANCH

PARK BUILDING

LONG DISTANCE TELEPHONE CALL. GRANT 67

Railway and Machinists' Tools and Supplies, Electri Traveling Cranes, Compressors, Pneumatic Hoists, Rivet ers, and complete Machine Shop and Foundry Equipment

NATIONAL CAR WHEEL COMPANY

MANUFACTURERS OF

"STAR SPECIAL"

Reg. U. S. Patt. Off.

CHILLED CAST IRON CAR WHEELS

WORKS:
Rochester, N. Y. Pittsburgh, Pa.
Sayre, Pa. Cleveland, O.
New York City, N. Y.

General Offices:
PITTSBURGH, PA.
New York Office:
556 WEST 34th STREET
Phila. Office:
506 FRANKLIN BANK BLDG.

BRAKE SHOES

AMERICAN BRAKE SHOE AND FOUNDRY COMPANY

MAHWAH, N. J.

NEW YORK
30 CHURCH ST.

CHICAGO
332 SO. MICHIGAN AVE.

This Space For Sale

NATHAN MANUFACTURING CO.
101 PARK AVE. NEW YORK

1612 Old Colony Building, Chicago.

Monitor, Simplex and Nathan Injectors for Locomotives

AND

Sight-Feed Lubricators.

All Specially arranged for High-Pressure Engines.

STEAM FIRE EXTINGUISHERS FOR SWITCHING AND YARD ENGINES.

Boiler Washers, Boiler Testers, Rod and Guide Oil Cups, Etc.

SOLE AGENCY FOR THE

Coale Muffler & Safety Valve Co., Inc.

SIPE'S No. JAPAN OIL
TRADE MARK REGISTERED
J. B. SIPE & CO.
MANUFACTURERS.
ALLEGHENY, PA.

ESTABLISHED 1884

SIPE'S JAPAN OIL

"STRENGTHENS, DRIES, AND WATERPROOFS;
Add Sipe's Japan Oil And Improve the Paint".

IN DAILY USE BY ALL THE LEADING RAILROADS IN THE UNITED STATES

MANUFACTURED ONLY BY

CHICAGO ILL. **JAMES B. SIPE & CO.** PITTSBURGH, PA.

LOCOMOTIVE BLOW-OFF

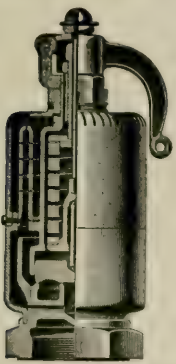
DOES SATISFACTORY WORK ON MANY ROADS.

Can be worked from cab or foot board while running.

A catalog or call by Representative for the asking.

Homestead Valve Mfg. Co.,

Works: Homestead, Pittsburgh, Pa.



CROSBY STEAM GAGE & VALVE CO.

Standard Locomotive Specialties
Make a Perfect Equipment.

Crosby Locomotive Pop Safety Valves,
Plain or Muffled.

Crosby Steam Pressure and Duplex Gages.

Crosby Counter and Pressure Recorders.

ORIGINAL Single Bell Chime Whistles.

Johnstone Blow-off Valves.

CROSBY STEAM ENGINE INDICATOR,
with Sargent's Electrical Attachment for taking any number of diagrams simultaneously.

MAIN OFFICE AND WORKS, BOSTON, MASS.

Stores: Boston, New York, Chicago and London, England.

Send for Catalogue and Prices,

BALL'S
VARNISH REMOVER

OXOLIN
REGISTERED
THE IDEAL PAINT OIL

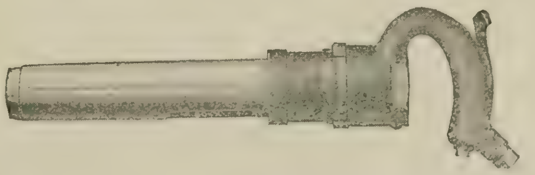
B. C.
SPIRITS

Ball Chemical Co.

CHICAGO Office,
63 W. Van Buren Street.

Fulton Bldg., PITTSBURGH, PA.

Logical Construction
is a feature of
BOYER
Pneumatic Hammers



No. 80X Boyer Riveting Hammer. Capacity 1⅜ inches.
Length overall only 21⅜ inches.

Boyer Hammers are made in three parts, cylinder, handle and valve—a construction which facilitates examination, cleaning and repairs, and extends the life of the tool indefinitely.

Write for Hammer Bulletin 124.

CHICAGO PNEUMATIC TOOL CO.

PITTSBURGH: 10 and 12 Wood St

1052 Fisher Bldg.
CHICAGO

Branches Everywhere

52 Vanderbilt Ave.
NEW YORK

H. H. HEWITT, PRESIDENT. W. H. CROFT, VICE-PRESIDENT

MAGNUS METAL

MEETS ALL HIGH-GRADE REQUIREMENTS.

IT IS THE STANDARD METAL

FOR LOCOMOTIVE WEARING PARTS,

JOURNAL BEARINGS FOR { FAST PASSENGER CAR SERVICE, HEAVY FREIGHT CAR SERVICE.

MAGNUS COMPANY

111 BROADWAY, NEW YORK.

DURABILITY COUNTS

DIXON'S SILICA GRAPHITE PAINT

is the "LONGEST SERVICE" paint. Recommended and largely used as standard by railroad economists, and engineers, throughout the entire world, for bridges, steel cars, tanks, signal apparatus etc. Made in FIRST QUALITY only. Write us for long service records and booklet No. 152-B.

Made in JERSEY CITY, N. J., by the

JOSEPH DIXON CRUCIBLE COMPANY

D X N TRADE MARK ESTABLISHED 1827 D X N TRADE MARK

THE SHARON COUPLER

TOP, BOTTOM AND SIDE OPERATED

For Freight, Passenger and Tender Service

All Parts interchangeable in All Types
EFFICIENT——and——RELIABLE

The National Malleable Castings Co.

CLEVELAND CHICAGO INDIANAPOLIS TOLEDO
SHARON, PA. MELROSE RARK. ILL.

PEERLESS Throttle Valve Packing

combines long fibre, braided asbestos with an efficient and lasting lubricant. The core is RAINBOW compound and the packing is graphited, extremely durable and efficient.

In rings, eight to the set. State Dia. Rod, I S. Dia. and Depth of Stuffing Box.

PEERLESS RUBBER MFG. CO.

31 Warren Street, New York

The Air Brake Game

today is a complicated one—and is growing more so daily. No longer will one general rule fit all cases—each individual case is a problem in itself, and as such must be met and solved. Our Engineering organization combines the experience of all railroad air brake engineers and, therefore, is specially fitted to take up and solve any and all air brake problems. Their services are free to our customers, who are requested to call them in on all air brake work, whether it be new specifications, modification of old equipment, or just ordinary, plain, every-day troubles.

Westinghouse Air Brake Co.

General Office, Wilmerding, Pa.

New York, City Investing Building; Pittsburgh, Westinghouse Building; Chicago, Railway Exchange Building; St. Louis, Boatmen's Bank Building.

Westinghouse
Electric Arc Welding Outfits

have reduced the repair costs in many railroad shops.
They save their cost in three months time.
Full information on request.—Booklet 3049-A.

Westinghouse
Electric Motors for Railroad Shops

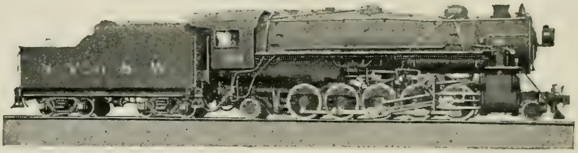
Pressed-Steel Types for either alternating or direct current. Rugged, serviceable, efficient and long lived.
Full information on request.

Westinghouse Electric & Manufacturing Co.

Sales Offices In All
Large American Cities

EAST PITTSBURGH
PENNSYLVANIA

2-10-2 TYPE LOCOMOTIVES



Total Weight of Engine, 352,500 pounds; Weight on Drivers, 293,000 pounds; Diameter of Drivers, 57 inches; Tube Length, 17 feet; Boiler Pressure, 190 pounds; Cylinders, 28x32 inches; Maximum Tractive Power, 71,200 pounds.

Because of its long rigid wheel base many railroad officials have had to eliminate the 2-10-2 type when considering more powerful locomotives.

Lateral motion driving axles and boxes were applied to the New York, Ontario & Western, 2-10-2 type locomotives to reduce the rigid wheel base to that which is in common use on Consolidation and Mikado type locomotives, and at the same time secure the advantages of the ten-coupled wheel arrangement with the resulting increased capacity of the locomotives.

Write us for further information regarding the lateral motion device

AMERICAN LOCOMOTIVE COMPANY
30 CHURCH STREET, NEW YORK

YOU GET THE MAXIMUM OF DURABILITY FROM OUR

SEMAPHORE ENAMEL

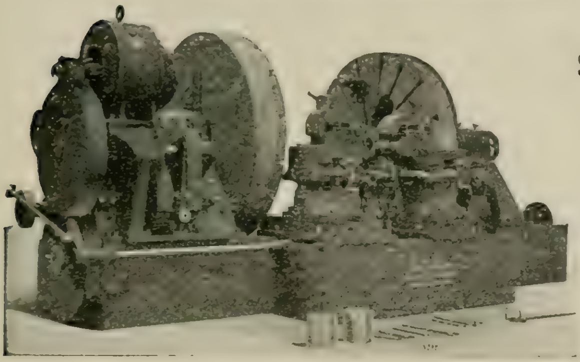
All colors—Write to us for samples.

Yarnall Paint Company
MANUFACTURERS - - - PHILADELPHIA

This Space For Sale

Railroad Repair Shop Equipment

Combining all modern features for rapid, convenient operation.



MACHINE TOOLS

STEAM HAMMERS

ELECTRIC TRAVELING CRANES

P. & W. SMALL TOOLS AND M. C. B. GAUGES

Niles New Model Driving Wheel Lathe
Has broken all wheel shop records.

WRITE FOR CATALOGUE

NILES-BEMENT-POND CO.

111 Broadway, New York. Pittsburgh Office, Frick Building.

Making Thermit Weld Without Removing Frame

Welding Frames In Place

With Thermit

Saves Time and Money

The mechanical officials of 420 Railroad Shops are saving thousands of dollars every year using "Thermit" for welding their broken engine frames in place, and are returning their engines to service in from 10 to 24 hours.

If you are not using **Thermit** in **YOUR** shop you are not taking advantage of the great saving that **Thermit** can effect.

Our new pamphlet 2167 will describe and illustrate what **Thermit** is doing for others. Shall we send it?

Goldschmidt Thermit Company

WILLIAM C. CUNTZ, General Manager

120 BROADWAY, NEW YORK

103 Richmond St. W., Toronto, Ont. 329-333 Folsom St., San Francisco
7300 S. Chicago Ave., Chicago

THE BALDWIN LOCOMOTIVE WORKS

PHILADELPHIA, PA., U. S. A.

LOCOMOTIVES

OF EVERY DESCRIPTION

Electric Motor and Trailer Trucks

SECURITY

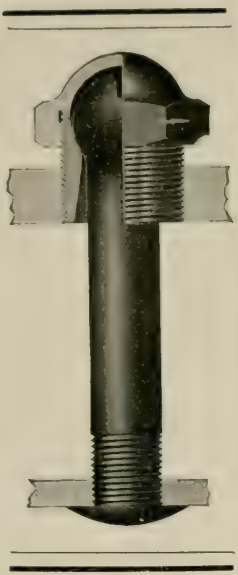
SECTIONAL ARCH

Makes staybolt inspection easy.
Saves flue troubles.
Reduces engine failures.
Easy to apply and remove.
Small brick of light weight.
Cools off quickly.
Many other good features.

AMERICAN ARCH COMPANY

30 Church Street,
New York

McCormick Building,
Chicago



The Best Staybolt
FOR LOCOMOTIVE FIREBOXES

Railroads Are Now Using
The Tate Flexible Staybolt
At the Rate of
1,250,000 A YEAR

Our Services Are Always
At Your Command

FLANNERY BOLT CO.
Vanadium Building
PITTSBURGH, PENNA.
B. E. D. Stafford, General Manager

J. Rogers Flannery & Co.
SELLING AGENTS
Vanadium Building
PITTSBURGH, PENNA.

This Space For Sale

HUNT-SPILLER IRON
HAS THE
STRENGTH AND WEARING QUALITIES
THAT ARE ABSOLUTELY NECESSARY IN
LOCOMOTIVE CASTINGS
PRICES MODERATE RESULTS GREAT
Manufactured Only By
Hunt-Spiller Manfg. Corporation
W. B. LEACH, President and Gen'l Manager.
J. G. PLATT,
Sales Manager.

OFFICE AND WORKS:
383 DORCHESTER AVENUE
SO. BOSTON, MASS.

GALENA-SIGNAL OIL COMPANY

FRANKLIN, PENNA.

Sole manufacturers of celebrated

GALENA LUBRICANTS

PERFECTION VALVE and SIGNAL OILS

and

Galena Railway Safety Oil

Manufactured for

STEAM AND ELECTRIC RAILWAY USES EXCLUSIVELY

Guaranteed Cost **Expert Service Free**

CHARLES MILLER,
Chairman.

S. A. MEGEATH,
President.

FORT PITT MALLEABLE IRON CO.

PITTSBURGH, PENNA.

MANUFACTURING SPECIALISTS
OF MALLEABLE CASTINGS
FOR THE RAILROAD AND
CAR COMPANY TRADE.

FEATURES

Superior Quality

Expeditious Delivery

Consistent Price

INDEX—ADVERTISERS.

NAME	Page
American Arch Co.	x
American Brake Shoe & Foundry Co.	iii
American Locomotive Company	viii
Baldwin Locomotive Works	x
Ball Chemical Co.	v
Brady Brass Co.	Front Cover
Butler Drawbar Attachment Co.	xviii
Chicago Pneumatic Tool Co.	v
Crosby Steam Gage & Valve Co.	v
Davis Brake Beam Co.	xxi
Dixon, Jos., Crucible Co.	vi
Flannery Bolt Co.	xi
Fort Pitt Malleable Iron Co.	xii
Galena Signal Oil Co.	xii
Gem Manufacturing Co.	Front Cover
Goldschmidt Thermit Co.	ix
Gould Coupler Co.	ii
Graham Nut Company	Front Cover
Homestead Valve Mfg. Co.	iv
Hunt-Spiller Mfg. Co.	xi
Independent Pneumatic Tool Co.	ii
Jacobs-Shupert U. S. Fire Box Co.	xvi
Johns-Manville Co.	xix
Johnson Bronze Co.	i
Locomotive Superheater Company	Front Cover
Magnus Company	vi
Manning, Maxwell & Moore	iii
McConway & Torley Company	xv
Nathan Manufacturing Co.	iv
National Car Wheel Co.	iii
National Malleable Castings Co.	vi
Niles-Bement Pond Co.	ix
Page Woven Wire Fence Co.	Front Cover
Peerless Rubber Mfg. Co.	vi
Pressed Steel Car Co.	xx
Railway Steel Spring Co.	xvi
Safety Car Heating & Lighting Co.	xvi
Schaefer Equipment Co.	xviii
Sipe, James B., & Co.	iv
Standard Coupler Co.	xix
Standard Heat & Ventilation Company, Inc.	xix
Standard Steel Car Co.	xviii
Steel Car Forge Co.	Front Cover
Stucki Co., A.	xxi
Suydam, M. B. Co.	Back Cover
The U. S. Metallic Packing Co.	xvi
The Railway Supply & Curtain Co.	xxi
Union Spring & Mfg. Co.	xiv
Union Steel Casting Co.	xix
Westinghouse Air Brake Co.	vii
Westinghouse Electric & Mfg. Co.	vii
Yarnall Paint Co.	viii

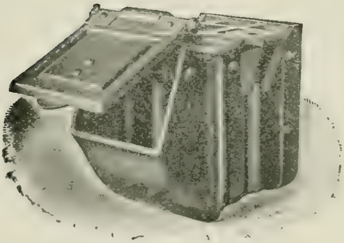
Union Spring & Manufacturing Co.

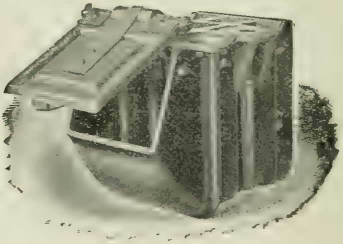
SPRINGS

Kensington All Steel Journal Boxes

PRESSED STEEL JOURNAL BOX LIDS

STEEL CASTINGS





Lightest and Strongest M. C. B.
Journal Boxes Made.

WORKS:
NEW KENSINGTON, PA.

GENERAL OFFICE:
First National Bank Bldg., Pittsburgh, Pa.

NEW YORK - 50 Church Street.
CHICAGO - Fisher Building.
ST. LOUIS - Missouri Trust Building.
RICHMOND, VA., AMERICAN NATIONAL BANK BUILDING.
LOUISVILLE, KY., 42 Todd Building.

OFFICIAL PROCEEDINGS
OF
The Railway Club of Pittsburgh

Organized October 18, 1901.

Published monthly, except June, July and August, by The Railway Club of Pittsburgh, J. B. Anderson, Secretary. General Offices, Penna. R. R., Pittsburgh, Pa.

Entered as Second Class Matter February 6, 1915, at the Postoffice at Pittsburgh, under the Act of March 3, 1879.

Vol. XVI.
No. 1.
Pittsburgh, Pa., Nov. 24, 1916.
$1.00 Per Year
20c Per Copy

OFFICERS FOR 1916—1917

President
J. G. CODE,
General Manager, W. P. T. R. R.,
Pittsburgh, Pa.

First Vice President
H. H. MAXFIELD,
Supt. Motive Power, P. R. R.,
Pittsburgh, Pa.

Second Vice President
D. M. HOWE,
Paint Expert,
Pittsburgh, Pa.

Secretary
J. B. ANDERSON,
Chief Clerk, Supt. M. P., P. R. R.,
Pittsburgh, Pa.

Treasurer
F. H. STARK,
Genl. Supt., Montour R. R.,
Coraopolis, Pa.

Executive Committee

L. H. TURNER, Supt. Motive Power, P. & L. E. R. R., Pittsburgh, Pa.
D. J. REDDING, Asst. Supt. Motive Power, P. & L. E. R. R., McKees Rocks, Pa.
F. R. McFEATTERS, Supt. Union R. R., East Pittsburgh, Pa.
A. G. MITCHELL, Supt. Monon. Div., Penna. R. R., S. S., Pittsburgh, Pa.
F. M. McNULTY, Supt. Motive Power, Monon. Conn. R. R., Pittsburgh, Pa.

Finance Committee

STEPHEN C. MASON, Secretary, The McConway & Torley Co., Pittsburgh, Pa.
E. K. CONNEELY, Asst. to Vice President, P. & L. E. R. R., Pittsburgh, Pa.
CHAS. A. LINDSTROM, Asst. to President, Pressed Steel Car Co., Pittsburgh, Pa.
L. C. BIHLER, Traffic Manager, Carnegie Steel Co., Pittsburgh, Pa.
WALTER V. TURNER, Asst. Manager,
Westinghouse Air Brake Co., Wilmerding, Pa.

Membership Committee

FRANK J. LANAHAN, President, Fort Pitt Malleable Iron Co., Pittsburgh, Pa.
A. STUCKI, Engineer, Pittsburgh, Pa.
C. O. DAMBACH, Supt., W. P. T. R. R., Pittsburgh, Pa.
HARRY HOWE, Inspector of Castings, Pressed Steel Car Co., McKees Rocks, Pa.
R. L. KLEINE, Chief Car Inspector, P. R. R., Altoona, Pa.
B. E. D STAFFORD, General Manager, Flannery Bolt Company, Pittsburgh, Pa.
SAMUEL LYNN, Master Car Builder, P. & L. E. R. R., McKees Rocks, Pa.

Entertainment Committee

D. H. AMSBARY, District Manager, Dearborn Chemical Co., Pittsburgh, Pa.
HARRY MURDOCH, President, H. Murdoch & Co., Pittsburgh, Pa.
E. C. SATTLEY, General Manager, Page Woven Wire Fence Co., Monessen, Pa.

Past President

J. H. McCONNELL	October, 1901, to October, 1903.
L. H. TURNER	November, 1903, to October, 1905.
F. H. STARK	November, 1905, to October, 1907.
* H. W. WATTS	November, 1907, to April, 1908.
D. J. REDDING	November, 1908, to October, 1910.
F. R. McFEATTERS	November, 1910, to October, 1912.
A. G. MITCHELL	November, 1912, to October, 1914.
F. M. McNULTY	November, 1914, to October, 1916.

* Deceased.

Meetings held fourth Friday of each month, except June, July and August.

PROCEEDINGS OF MEETING, NOVEMBER 24, 1916.

The monthly meeting of the Railway Club of Pittsburgh was called to order by President J. G. Code at the auditorium of the Commercial Club, Pittsburgh, Pa., at 8 o'clock, P. M.

The following gentlemen registered:

MEMBERS.

Adams, Lewis
Allen, J. P.
Allison, John
Amsbary, D. H.
Anderson, A. E.
Anderson, J. B.
Arnold, J. G.
Babcock, F. H.
Barth, J. W.
Bean, W. H.
Bell, R. P.
Berg, Karl
Berghane, A. L.
Bihler, L. C.
Bosley, W. D.
Bowden, T. C.
Bradley, W. C.
Braun, O. F.
Brewer, W. A.
Brunner, F. J.
Buffington, W. P.
Calvin, A. W.
Cassiday, C. R.
Chittenden, A. D.
Clark, Chas. H.
Code, J. G.
Copeland, T. T.
Courtney, D. C.
Crawford, D. F.
Crenner, J. A.
Cunningham, R. I.
Cunningham, W. P.
Damboch, C. O.
Dickinson, F. W.
Donovan, P. H.
Early, G. G.
Emery, E.
Flinner, John
Forrest, C. H.
Frey, A. P.
Gale, C. H.
Gies, G. E.
Gilg, H. F.
Graham, R.
Grewe, H. F.
Gross, C. H.
Guay, John W.
Hackenberg, J. O.
Hansen, G. L.
Haskin, E. G.
Haynes, J. E.
Hindman, S. M.
Hoffman, C. T.
Howe, D. M.
Howe, Harry
Huchel, E. W.
Huchel, H. G.
Huchel, W. J.
Hudson, W. L.
James, R. E.
Johnson, A. B.
Kinch, L. E.
Koch, Felix
Kummer, J. H.
Lanahan, Frank J.
Lang, W. C.
Lansberry, W. B.
Lindstrom, Chas. A.
Llewelyn, W. R.
Lobez, P. L.
Long, R. M.
Loughridge, H. W.
Lowe, W. D.
Lowry, R. N.
Lynn, Saml.
Maier, J. L.

Marshall, W. T.
Mason, Stephen C.
Matchett, H. K.
Maxfield, H. H.
Maylock, E. A.
Millar, C. W.
Miller, F. L.
Milligan, E.
Mitchell, John
Morgan, D. G.
Morris, H. W.
Murdoch, Harry
McDonnell, F. V.
McFarland, H. L.
McFeatters, F. R.
McKinstry, C. H.
McNulty, F. M.
O'Connor, M.
Painter, Joseph
Parke, F. H.
Phillips, Lee
Rabold, W. E.
Redding, D. J.
Reese, O. P.
Richardson, C. A.
Richardson, W. P.
Sattley, E. C.
Schaich, W. L.
Schultz, G. H.
Searles, E. J.
Shirk, A. R.
Sleeman, Wm. C.
Snyder, F. I.
Spindler, D. G.
Stafford, B. E. D.
Stark, F. H.
Stevenson, Wm.
Stillings, Wm.
Streib, J. F.
Stucki, A.
Sturmer, G. W.
Suckfield, G. A.
Summers, J. M.
Thomas, E.
Thomas, J. H.
Turner, L. H.
Unger, J. S.
Waggoner, R. E.
Wardale, H. G.
Wegener, Henry
White, F. L.
Williamson, J. A.
Woernley, H. F.
Wright, J. B.
Wyke, J. W.
Zortman, C. E.

VISITORS.

Aiken, G. A.
Ainsworth, John
Bennett, B. W.
Bleem, E. B.
Bole, J. K.
Buell, D C.
Code, C. J.
Denzel, H.
Dummett, T. C.
Frank, I. W.
Geisler, J. J.
Griffin, M. E.
Guy, W. A.
Henry, J. W.
Horn, Frank
Horne, G. B.
Jamison, A. A.
Kern, George S.
Kindle, W. F.
Lamb, C. M.
Lent, John F.
Longenecker, A. H.
Macabee, G. R.
Mason, C. E.
Meyers, J. M.
Montgomery, J. L.
Moore, F.
Myers, C. E.
McMunn, John
Nicholson, H. L.
Paisley, R. M.
Penrose, H.
Penton, John A.
Rasbridge, R. B.

Reese, W. J.
Sage, R. V.
Seaman, C. H.
Sitterly, W. H.
Smith, C. C.
Speedy, F. E.
Stenson, G. A.
Unger, Wm. S.
Whitman, C. E.
Williams, C. F.
Wolf, M.

The reading of the minutes of the October meeting was dispensed with, the minutes having been published in the official proceedings for that month.

The Secretary read the following list of applicants for membership:

Aiken, Glen. A., Sales Manager, American Nut & Bolt Fastener Co., Ontario and Doerr Strets, Pittsburgh, Pa. Recommended by E. C. Sattley.

Bennett, Byard W., Treasurer, Standard Tin Plate Company, Canonsburg, Pa. Recommended by E. C. Sattley.

Boyle, C. W., Sales Engineer, Oxweld Acetylene Company, 2201 Farmers Bank Building, Pittsburgh, Pa. Recommended by F. M. McNulty.

Brinser, C. E., Division Engineer, Pennsylvania Railroad, 30th Street, S. S., Pittsburgh, Pa. Recommended by A. G. Mitchell.

Cahill, M. H., General Superintendent, B. & O. R. R., Water Street Station, Pittsburgh, Pa. Recommended by C. A. Richardson.

Campbell, J. S., Engineer, Union Railroad, 5418 Second Avenue, Pittsburgh, Pa. Recommended by C. A. Richardson.

Carroll, W. J., Station Master, B. & O. R. R., 3011 Zephyr Ave., Sheraden Terrace. Recommended by C. A. Richardson.

Duke, A. W., Assistant Supervisor, Pennsylvania Railroad, South Brownsville, Pa. Recommended by W. P. Conner.

Durkin, James E., Foreman, Fort Pitt Malleable Iron Company, 812 Thompson Avenue, McKees Rocks, Pa. Recommended by Frank J. Lanahan.

Elder, C. K., Auditor, Monongahela Railway Company, Box 558, Brownsville, Pa. Recommended by E. E. Root.

Fleming, H. L., General Foreman, B. & O. R. R., 328 Renova Street, Pittsburgh, Pa. Recommended by C. A. Richardson.

Forster, J. A., Asistant Storekeeper, Pennsylvania Railroad, 127 Wall Avenue, Wall, Pa. Recommended by M. F. Loughner.

Flower, Edwin S., Storekeeper, Monongahela Railway Company, South Brownsville, Pa. Recommended by E. E. Root.

Follet, Louis, President, Standard Tin Plate Company, Canonsburg, Pa. Recommended by E. C. Sattley.

Galloway, T. R., Assistant Master Mechanic, B. & O. R. R., Glenwood, Pittsburgh, Pa. Recommended by C. A. Richardson.

Geisler, Joseph H., Foundry Foreman, Fort Pitt Malleable Iron Company, 1453 Orator Street, Pittsburgh, Pa. Recommended by Frank J. Lanahan.

Gray, C. B., Master Mechanic, Pennsylvania Railroad, Thirty-second and Carson Streets, S. S., Pittsburgh, Pa. Recommended by A. G. Mitchell.

Grow, C. D., Rule Examiner, B. & O. R. R., 56 Hazelwood Ave., Pittsburgh, Pa. Recommended by C. A. Richardson.

Hoffman, J. M., Superintendent Carnegie Steel Company, Box 14, Monessen, Pa. Recommended by E. E. Root.

Hood, J. C., Vice-President and General Manager, Crescent Paste Company, Wilkinsburg, Pa. Recommended by E. E. Root.

Hott, G. H., Assistant Chief Clerk to General Superintendent, Monongahela Railway Company, Brownsville, Pa. Recommended by E. E. Root.

Jameson, A. A., Shop Accountant, Monongahela Railway. Box 782, South Brownsville, Pa. Recommended by E. E. Root.

Kindle, W. F., Inspector Carnegie Steel Company, 905 Woodward Avenue, McKees Rocks, Pa. Recommended by Wm. J. Huchel.

Laurent, George F., Foreman Finishing Department, Fort Pitt Malleable Iron Company, 716 Island Avenue, McKees Rocks, Pa. Recommended by Frank J. Lanahan.

Lent, John F., President, Lent Traffic Company, Farmers Bank Building, Pittsburgh, Pa. Recommended by E. C. Sattley.

Lutton, Harry C., Road Foreman Engines, Monongahela Railway Company, Box 413, South Brownsville, Pa. Recommended by E. E. Root.

Meyers, John M., Chief Engineer, Atlas Automatic Jack Corporation, 5169 Liberty Avenue, Pittsburgh, Pa. Recommended by Frank J. Lanahan.

Moffat, H. E., Chief Clerk Accounting Department, Monongahela Railway Company, Box 558 Brownsville, Pa. Recommended by E. E. Root.

Moore, Frank, President, Pittsburgh Malleable Iron Company, Thirty-fourth and Smallman Streets, Pittsburgh, Pa. Recommended by Frank J. Lanahan.

Mowry, E. H., Agent, B. & L. E. R. R., Duquesne, Pa. Recommended by C. O. Dambach.

Norton, E. K., Assistant to President, Standard Tin Plate Co., Canonsburg, Pa. Recommended by E. C. Sattley.

Reese, C. E., Order Department Standard Tin Plate Company, Canonsburg, Pa. Recommended by E. C. Sattley.

Reese, W. J., Secretary, Standard Tin Plate Company, Canonsburg, Pa. Recommended by E. C. Sattley.

Rodgers, G. L., Chief of Tariff Bureau, Monongahela Railway Company, Box 648, Brownsville, Pa. Recommended by E. E. Root.

See, Theodore S., Superintendent Jones & Laughlin Steel Co., 3624 Perrysville Avenue, N. S., Pittsburgh, Pa. Recommended by M. O'Connor.

Short, L., General Foreman, P. & L. E. Railway, 106 Richlieu Avenue, New Castle, Pa. Recommended by D. H. Amsbary.

Simpson, L. E., Accountant, Monongahela Railway Company, South Brownsville, Pa. Recommended by E. E. Root.

Snider, Charles, Chief Clerk to Master Mechanic, Monongahela Railway Company, South Brownsville, Pa. Recommended by E. E. Root.

Spencer, Robert L., Superintendent, Duquesne Warehouse Co., Pittsburgh, Pa. Recommended by A. G. Mitchell.

Stahlman, M. O., Clerk, Pressed Steel Car Co., 110 Churchill Street, McKees Rocks, Pa. Recommended by Wm. C. Sleeman.

Tanner, Chas. J., Draftsman, Monongahela Railway Company, Box 92, Brownsville, Pa. Recommended by E. E. Root.

Tweed, H. W., Assistant Auditor, Monongahela Railway Co., Box 553, Brownsville, Pa. Recommended by E. E. Root.

Wassell, F. L., Secretary, Locomotive Stoker Company, Robinson and Darrah Streets, N. S., Pittsburgh, Pa. Recommended by E. A. Craig.

Whitman, Edward B., Assistant Road Foreman Engines, Pennsylvania Railroad, 217 Pennsylvania Station, Pittsburgh, Pa. Recommended by W. L. Hudson.

Williams, B. D., Chief Clerk to Train Master, Monongahela Railway Company, 111 Broadway, Brownsville, Pa. Recommended by E. E. Root.

Williams, C. F., Associate Editor, Iron Trade Review, 2149 Oliver Building, Pittsburgh, Pa. Recommended by Frank J. Lanahan.

Williams, F. C., Accountant, Monongahela Railway Company, Box 41, West Brownsville, Pa. Recommended by E. E. Root.

PRESIDENT: Upon approval by the Executive Committee and the payment of dues the gentlemen whose names have been read will become members of the Club.

The President announced a change in the date of December meeting to Monday, December 18th, on account of the proximity of the regular date to the holidays.

MR. D. M. HOWE: We all know that the uppermost thing in the minds of the people of Pittsburgh at the present time is taking care of the old homestead of Uncle John Brashear. I would move that this Club contribute the sum of $25.00 for this purpose.

The motion was duly seconded and carried by unanimous vote.

PRESIDENT: There was a suggestion made at the September meeting that a Transportation Committee be appointed to assist the Executive Committee on various matters. That Committee will consit of Messrs. A. G. Mitchell, A. D. Chittenden, A. D. Brown, J. A. Spielmann, and the President will reserve the appointment of the fifth member of that Committee.

It is now my pleasure to introduce to you the eminent John A. Penton, Editor, Iron Trade Review, who will address you upon a subject which no doubt will be of interest to every member of the Club.

OBSERVATIONS — OPERATION OF TRANSPORTATION FACILITIES AND MANUFACTURING ACTIVITIES IN THE VERDUN REGION.

By Mr. John A. Penton.

When the opportunity came to me, very unexpectedly, in the early part of the summer, to take a trip to that greatly wartorn country of France, I of course naturally said I was too busy and it was the last thing I had any intention of doing. But, after great persuasion on the part of some friends, I decided on a Wednesday morning that it was possible to take the trip. I left Cleveland Thursday evening for Washington in order to secure passports which I partly secured on the Friday just in time to enable me to sail on Saturday. I mention this now because I would like to have you feel that perhaps if I had had a greater measure of preparation I might possibly have been able to offer something of a more entertaining character than is at all likely under the circumstances.

At the outset I wish to say that anyone who thinks of going to any one of the countries involved in this terrible war is going to meet at this particular time almost unconquerable obstacles. Unless you can demonstrate that you have some important business matters abroad that require attention or prove by letters of introduction or the support of influential friends that your mission is a necessary and entirely honorable one, you will meet with difficulties of a serious character at the office of the State Department in Washington where, I am told, they decline the necessary authorization to about 50 per cent of those who request it and that of those who do secure it over 20 per cent are turned down later on at the various offices in New York whose further permission has to be secured before you are allowed to embark on the steamer.

In securing your passport it is necessary to give rather an extended family history as well as a statement as to the nature of your business, what you are going to Europe for, and how long you expect to stay. In New York you have to see the office of the French Consul, officers of the Steamer Company and later on not only you but your baggage as well must pass the closest inspection at the dock, where you once again must give a detailed statement of your antecedents; nationality of your parents and grandparents; if you have any interest at stake in any of the countries at war; if you have been in any of these countries before; the character of your business or the necessity that is calling you abroad; if you are selling goods for American concerns; whether you are carrying correspondence or papers to any nation (or individual of such nation) at war, and answer scores of other questions of a similar character.

If you manage to meet successfully, all of these inquiries, and many do not, the officers of the French army and the officers of the steamboat carefully examine your baggage for explosives or contraband material.

The reason for all this of course is the unusual amount of espionage from which they are suffering in these countries, which they are anxious to eliminate as far as possible. It is pretty generally understood in France of course, that the character of the watchfulness of the countries which are at war enables them to know a great deal of what is going on and that it is not unlikely that some of the movements of enemy troops are known and a certain amount of knowledge of the manufacturing plants of the Central Powers of Europe may be possessed by the countries of the Allies. So much is true, however, that I was informed by the Lieutenant of the French army who accompanied me for a number of weeks during my stay in France, on visits made to a number of munition plants, as well as to portions of the front, that the German officers are so generally well informed concerning what goes on in France that when the chief officer of the army and staff go to the French front, back several miles from the firing line, this information becomes known some way to the enemy who is able to commence firing upon almost the particular point that is being visited. This happens sometimes when the officers are only at the front perhaps for a few hours and when they come and go entirely unexpectedly and while they are entirely at a loss to know just how this is discovered, they know that is is true and that the intelligence is conveyed to the enemy and constantly men are being found in France, who, it is claimed represnt some of the enemy countries and in spite of all the vigilance it is not an unusual occurrence to hear of the arrest of individuals whose loyalty and integrity are suspected or who are discovered engaged in secret communication with the enemy. This, in spite of the fact that the greatest care is taken by the officers and police force and representatives of the government everywhere and citizens even when they are apparently well-known are frequently called upon to show their papers and prove their identity.

When a stranger arrives in Paris he has to go first to the office of the prefect of police in order to procure a "permis de jour" or permission to remain and here again he has to have his papers examined and give an extended statement as to his occupation, his antecedents, the character of his mission, with a large amount of other information of the same general character.

Happily for me, I was unusually well fortified with letters from a very distinguished citizen of our state, namely Governor Herrick, who acquitted himself while Ambassador to France in a way that reflected the greatest degree of honor and credit upon every American citizen as well as himself—so much so that probably he is more highly respected in France than any other resident of any neutral nation.

While the French officers and representatives of the government were frequently unable to read the letters which were given to me by Governor Herrick, yet they knew his name always and I learned, long before I left France that if I had to part with either my passports or his letters in my travels about the country visiting the hospitals, provision and engineering depots, manufacturing plants or the front itself, I might better part with the American passport than with these letters from a citizen of my own country. He gave me letters to a number of men occupying eminent positions in social, financial and governmental affairs and I fell heir thereby to his very unusual reputation and standing in that country and was given as a result some very remarkable opportunities to see the steel and munition manufacturing plants and transportation systems in a way that is not generally accorded any one much less a foreigner and as I have some little general knowledge of the steel industry, I think perhaps I saw many things that would not have been noticed by the average man.

As you will remember, in the fall of 1914, when the German army was within a few miles of Paris the officers of the French government with a great many train loads of valuables of a financial, documentary and monetary character left Paris and removed to the city of Bordeaux on the southwestern coast, they were followed shortly by all the officers of the city Paris, and officers of other French organizations, all of whom fled to other cities and these were followed in turn by the Ambassadors and consulary representatives of a number of countries with one or two exceptions. The result of this was that it left Governor Herrick practically, for some time, in the position of civil governor of the city of Paris and he was naturally looked upon by the people as the only one left in authority of a civil character, the city being under martial law and the military being in the charge of General Gallenix, who afterwards won fame as a leader in the battle of the Marne.

Governor Herrick I was told, at the time of the approach of the German army, when it seemed almost certain they would enter the French capital, had a large number of placards printed which were distributed among American citizens with instructions to display them upon their residences, and these carried the announcement that they were the abode of Americans and therefore should not be molested. Then when the crowds surrounded the American embassy, he was always available to offer cheer and advice, making a great many public addresses in and about the embassy, assuring the thousands of people who gathered in that vicinity that he felt there was no immediate cause for alarm. By this means he exercised a very quieting influence upon the situation in Paris which was reflected more or less over the entire part of that country not occupied by the enemy.

After the battle of the Marne, which occurred on September 6, this situation was more or less altered and before long the civil government of Paris again took charge of the administration and a more normal condition began to be inaugurated. You know, it is stated in Paris quite positively that it was generally understood that all arrangements were being completed by the German army for their march into Paris down the Champs de Elysees and under the Arch de Triomph, erected by Napoleon and this triumphant entry was scheduled for the morning of September 9, but while the German army was preparing for this event, the French army was reorganized and before daylight on the morning of September 6, in the year 1914, the German army found itself very suddenly attacked on both flanks and by an enemy which they thought had been completely dispersed and demoralized. At the end of the week, instead of being eight or nine miles from Paris, the German army was back 22 miles, while now it is 58 miles distant and no one in Paris is to be found who thinks it will ever be any nearer.

While it would seem almost impossible to present anything new at this time with reference to the underlying causes that brought about this terrible conflict, it may not be out of place to state that in France, at least, they appear to entertain no illusion, while they have some positive convictions of a somewhat different character than those universally entertained in the United States. The general judgment of the French people who are fully informed and whose opinion is worthy of respect is very similar to that of a very eminent American publisher who recently traveled in Germany, meeting and conversing with important governmental officials and with whom I had a more or less extended conversation. The feeling entertained by the party to whom I refer is that there was a more or less universal sentiment in Germany that sooner or later that country would have to engage in a struggle with Russia for its existence, because of the gradual growth of certain Russian ambitions and the fact that it was apparently building for the future in preparing for a struggle and that aside from any other causes which may have furnished an immediate excuse or reason for the war, there was this sentiment that if Germany had to meet this emergency the sooner it should be done the better, before Russia was fully prepared. As a preliminary to this it was going to be necessary to attack France who, it was believed would attack Germany the moment it became involved with Russia.

To set aside all the conflicting statements that continue to appear in the hundreds of printed columns of printed pages of testimony at various times and look at the cause of the war in the light of reason, the foregoing statement would seem to offer the most plausible series of arguments and one that is universally accepted in France and the one which my American friend, who was in Germany says is the one that is understood to be the mainspring of the conflict in that particular country.

One other conclusion entertained in France, radically different from the one held in America is that the Kaiser and Bethmann-Hollweg are both strong representatives of what might be regarded as a sort of peace party in Germany; that they did not represent the aggressive and dominant element. They go so far in France as to give the Kaiser and Bethmann-Hollweg credit for having kept Germany out of war on a previous occasion, while on the other hand the Frenchman doesn't believe he is fighting the Germans or Germany in the strict sense of the word, but is engaged in mortal combat with what is known as the Prussian military element and the Frenchman regards a defeat as one that would practically wipe France off the map, nor is it contended by any one that France was looking for, preparing for, ready for, or expecting war.

The German people have been preparing for this possible and in their judgment inevitable conflict for a number of years. The German people, as far as any one can learn from those who have intimate acquaintance (and this statement is in entire harmony with those which have since been made officially) did not believe—in fact they were positive, that the English government would not in any way interfere and they are now claiming that England had made it appear as if they would not enter into a conflict in order that Germany might involve itself and after Germany had become engaged in this mammoth war, England joined the side of the Allies and their resentment of the violation of Belgium and Belgian neutrality was only an excuse.

They further claim as proof of this that England was the last one to enter the war; that while war had been started against France and Belgium by Germany on August 2, England did not signify its intention of becoming a party until August 4, 1914, when it insisted upon the neutrality of Belgium should be respected.

The German government officials are also a unit in declaring that had they known that England was going to become engaged in the struggle, Germany would not at this time have encouraged a war such as is now going on—hence the feeling of intense bitterness on the part of Germany towards England as explained very largely by the Germans themselves.

The French people are not deluding themselves in any way with reference to this issue; they realize that it is going to be long drawn out. The statement recently made that the German nation is preparing for a war of ten years would seem to represent the thought in France that it might possibly extend that length of time.

With this condition, owing to the unpreparedness of the French nation, they had a feeling there in the summer of this year, that they would be hardly prepared to do themselves justice on the fronts until the Spring of 1917, while the official statements of the Premier of Russia and other Russian officials (some of them in France,) and the sentiment of the French officials who had been in Russia and had returned, were to the effect that Russia could hardly get ready before the Spring of 1919, and this would seem to intensify the feeling that the end of the war is not yet in sight.

In my own judgment after being over there and seeing more than could ever be told in a brief address of this sort, and conversing with Englishmen and Frenchmen engaged in various occupations such as publishers, officers of the army and business men, the war is not much more than started in some respects. It may last a considerable number of years and if the German statement that they do not intend to relinquish Belgium or any of the territory they have taken can be relied upon the war will be almost semi-permanent in character and the date of its termination is a long time in the future. It is not going to be settled by compromise. It is a war in which men's passions and prejudices have been aroused in the most intense manner. It is a matter of principle on the part of everybody involved only in France, there is no "hymn of hate"; there is no great bitterness towards Germany; they are engaged entirely in a war of defense; they want their country back; they want the France of their forefathers, the France of tradition, romance and history and to attain that end, they are consecrating and dedicating not only all they possess but their lives as well. Everyone in France has practically said "goodbye" to life. The worst thing that could possibly happen (they think) is at their door and life as a part of the German nation, when they had committed no crime, were not envious of any of their neighbors and were not ambitous at the time the war broke out to inaugurate or be a party to any war, large or small, is a condition that is more unbearable than death itself.

There is more talk of peace in the United States than there is in all France. There is no quibbling over there about such a small matter as one-half of one percent, or two or three or five or any other percent in the way of an income tax. There is no lack of unity. They are willing to give everything and all, There is an entire absence of criticism of their government and in a general way, I believe it is true the peoples of all the nations at war were never more united than they have been united by this struggle and this refers to Russia, Germany and England, as well as France and possibly Austria, Turkey and Italy as well. It is understood that there is some difference of opinion in Germany—some criticism of their government but it is also understood that the only criticism is not that the war was encouraged by Germany, but that the war is not being conducted with a greater degree of energy and perhaps bitterness not only towards their acknowledge enemies, but toward some of the neutral powers.

We read in the daily papers and in magazines sometimes, that in the central part of Germany there is no appearance of war and the terrible struggle that is going on; that business continues as usual in every direction and every effort is made to eliminate in Germany and among the German people all evidences and trace of conflict. This may be true and I can cast no reflection upon the accuracy of that statement, but it is not true in France, because no matter in what part of the nation you may be whether Marseilles on the South, Bordeaux on the West, Havre on the North or Rouen, Annens, Bauvais, Rheims, Lyons or Orleans, or on the front, the whole of France is one gigantic battle front, with everyone who is old enough to think doing his part, doing all he can irrespective of age or sex. The old man and the old women are taking the place of the younger men and the younger women. They are all drafted into service on behalf of their government. They are all giving of their best effort in the most remarkable and unusual spirit of cheerfulness and optimism, without complain. They are giving all and everything that France may win—that the younger men who are bearing the burden at the front may win back from the enemy that portion of France which has been taken away. Every effort is made to have the soldier at the front realize that every living human being in France is behind him and every effort is made to have the people behind the front understand and appreciate the sacrifice that is being made by the soldier on behalf of their country.

This is shown more perhaps than anything else in the extent to which women are bearing so much of the burden and the strain. Our boat had hardly landed at the dock before we saw women hitched to carts in which there were loads big enough for a horse to draw. We saw women driving trucks and vans; women operating the motors and collecting the fares on street cars; women engaged in street-sweeping and a hundred other occupations all through the nation that we had never seen performed by other than men before.

Of course the most spectacular evidence of all this is to be found in the iron and steel and munition plants, where women are doing what would appear to be almost the impossible, to the average American. I have seen women engaged around blast furnaces, women in a bessemer plant, women working around the open hearth furnaces, women in iron foundries, forge shops and while they were not perhaps in these occupations doing those things which required severe physical strain or heavy lifting they were doing thousands of things which ordinarily are done by men in America.

In the munition manufacturing plants women are to be found in the great majority. I could tell those here this evening of scores of instances where women were doing work of a most remarkable and accurate character; women running lathes, shaping machines; women making tools, taps and dies; women doing work with the finest micrometer gauge down to the thousandth part of an inch and at one most remarkable plant, which had been completely erected in four months from the bare ground, which when I saw it, consisted of a series of well-constructed, well-designed buildings, one story high with a light steel truss roof, hollow tile sides concreted over, in which the general sanitary conditions were the most wonderful I have ever seen. The statement was made that of the 9,000 employees the 7,000 women employees were doing 20 per cent better work than the men. This was only a sample of the statements made on every hand in plants in every direction. In this particular shop were hundreds of modern machine tools, the great bulk of them from the United States, although some were made in France, apparently with as fine attention to detail and finish and especially designed for the work in hand. Women were operating nearly all of the machinery with the exception of the forging shops, heating furnaces and heavy work about the yard and a few very heavy tools.

The remarkable thing in this connection was the cheerful, optimistic enthusiasm that appeared to permeate the whole atmosphere; the anxious desire to do as much as possible and to do it as well as it could be done; the feeling that every effort made was an aid to the loved ones at the front and on behalf of their beloved France; the thought that such measure of self-sacrifice and devotion could not fail to bring its reward in a day, yet to come is the mainspring behind the extraordinary effort that I have not seen equalled or excelled in any similar plant in any part of the world, much less in America, if I may give utterance to my own judgment through such acquaintance as I have of industrial conditions as they are in this country.

The wages paid amount on the average to ten francs per day, which amounts to $2.00 in America money, but owing to the depreciation of the French money, this at present amounts to $1.70.

The conditions throughout this entire nation are similar to those in the one plant to which I have referred. I have in mind other plants where they are nearly three times as many employees doing the same kind of work. I regret that the proprieties will not permit of giving you in more extended details just the exact quantity and quality of the output.

Every plant, every industry, and every establishment very nearly in all France that can be utilized successfully is engaged in the manufacture of material of some character or other needed in the war. Food, clothing, shoes, harness, wagons, automobiles, guns, bayonets, munitions—hundreds of kinds, spades, shovels, materials used in trenches and all the lighter equipment. Then again there is being made, machinery and tools with which to make this equipment in an ever increasing quantity.

Great silk and cotton plants and such world famous establishments for the production of art goods as those of Lyons and elsewhere have turned over their buildings and employees to the making of war material.

They realize over there that it is a war in which very largely the transportation problem has become one of the chief factors. It is admitted that one of the weaknesses at Verdun on the French side at the great battle there was the lack of transportation facilities of an adequate character. No one could have foreseen and no one can believe as a result of any description, the vast nature of the undertaking and the amount of transportation facilities required to take care of the movement of the large bodies of troops, munitions, guns, food, supplies of a thousand different varieties, which problem was attacked and solved shortly after the seriousness of the situation began to be fully realized by the appointment of a commission of brilliant French engineers who organized a transportation service of about 3,500 motor trucks, which were kept going all day and all night from the supply base to the front and later on this commission with its increased efficiency and knowledge of transportation problems and its greater knowledge of how to overcome obstacles of an unusual character, had charge of a similar situation on the Somme.

Thousands and thousands of miles of narrow gage and standard gage railroads have been built since the war began and for many months at a time as much as four miles of small narrow gage track have been constructed, upon which ran small light locomotives pulling four or five small cars on track 30 inches wide. This track is made in sections with ties and rails all fastened in place so that it can be quickly laid down and fastened together on the top of the ground without ballast. When orders are given to lay this track the engineering corps has become so efficient that a mile in a few hours in some particular section is known to have been frequently constructed and when emergencies called for it, two lines one beside the other have been quickly laid so that the little trains could pass each other uninterruptedly without waiting for switches or turn-outs.

In the rear, the French front has been paralleled with many miles of railroad track for quick transportation of material and radiating towards the front have been constructed many lines of track from central points where none hitherto existed. In addition to this there have been constructed large depots and yards one for each sector of the front at which are gathered together all the material required for the army belonging to that particular sector and this is distributed by standard railroads as far as possible and then transported by motor trucks to a point as near the front as possible.

There is today about 75,000 motor trucks in use in the French army and the great responsibilities connected with keeping these all in shape and first-class condition has required the construction of enormous depots where they are able to completely repair, repaint, overhaul, put on fresh tires and send out as many as 100 motors a day, which have to be fully inspected and made as perfect as possible in every detail before leaving as the service is most severe and the requirements of a most exacting character. The extent of the mammoth buildings in which this repairing is constantly going on day and night and a full description of the organization, the methods pursued, the character of the shops, machine tools and general equipment would of itself take hours to adequately explain.

Each motor truck is kept as near as possible at the top notch of efficiency.. If there is the slightest thing wrong it is immediately sent to a repair shop, because they fully realize that the time to correct a growing fault is at its beginning. Each one has large numbers painted on its sides. An accurate statement of what each motor truck does is systematically maintained. A record of each one of the drivers is at all times available.

Each truck carries two drivers, so that when one falls asleep the other relieves him. These cars are kept in such constant service that the drivers' chief opportunity for sleep is while they are being operated by one of the two men. The standard macadamized roads of Northern France were never of such value to the nation as they are now in this great emergency.

In these large repair plants they of course use a great many German prisoners as they are in all parts of France and upon work of every character.

I saw a brass foundry in one motor truck repair department where they had about 30 people working making small brass castings, all being German prisoners with a German foreman. Here as well as every other place the German prisoners were paid the same rate of wages as are paid the French soldier and they receive the same fare which is really surprisingly excellent. They have barracks exactly similar in character and their comfort is carefully looked after as is the comfort of the French soldier. Thousands of German prisoners are to be seen all over France building railroads, depots, laying tracks and engaged in other work of this character. In one place they were building docks and were at work in the ship yards. In another place they were at work in munition plants. They likewise build the trenches and in all cases are well housed, well cared for and apparently well satisfied. They are of course compelled to wear the German uniform. They never work alone as individuals, but in companies more or less under guard, although a guard is almost superfluous as all eyes are upon them at all times and this they fully realize.

While speaking of the German prisoners, I want to say that about one-third of the wounded in the Somme hospital, which had a good many hundred the day I visited it, were Germans and they were receiving the same care and attention in every way, that is given to the French wounded. They have a phrase in France, which I cannot repeat which means "a wounded man has no nationality" and they seem to be proud of the fact that there is no differentiating when it comes to the wounded soldier. In fact the hospital surgeons and those in charge say they have no time, that the necessity of putting the wounded through in regular uniform standard method necessitates rapid action and they have to treat them just as they arrive, although as far as possible they keep the German wounded in wards by themselves. They go so far in this particular as to allow the same amount of tobacco to the German as they do to their own countrymen.

There is apparently plenty of food of every character in France. They live fairly well. The great monumental markets in Paris are filled to overflowing and I do not know that I have ever seen such a large amount of food in any one market in my life as there, although it is much more expensive than it was at one time. They are beginning to economize and are enacting legislation of an economical character with reference to their food supply more in view of a future emergency than because of a present necessity, as far as France is concerned. They do not overlook the fact that this war is likely to last a long time. In everything that is done they are keeping their eyes upon the far distant day, when they feel that the struggle will be of a much more severe character and tax the resources of the country to a far greater extent than is being done at present.

Of course the most remarkable thing, the one great, spectacular, impressive, never-to-be-forgotten impression that one gets upon a visit to France at a time like this, is that one feature about which so much as been written, namely "The Spirit of France." They are doing everything so cheerfully, as I have said before. They are doing it as they think—to save their country, as I have repeated and, strange to say, each individual seems to be imbued with the one ambition, namely to outstrip all other individuals and do a little more, if possible than is required. Each one is ambitious to increase his allotment and enlarge the output. Everybody is anxious. Nobody watches the clock. Nobody complains and everybody is not only doing their full share, but is endeavoring to inspire and encourage others in the same way.

To the average American citizen who knows only the meaning of the word "patriotism" as we have it in America with our political and sectional differences, it may not seem out of place to say that I never fully appreciated or new the meaning of the word "patriotism" until I saw it really demonstrated on this particular trip to France.

Whether it is in the trenches or back in the hospitals, in the field or on the railroad, on the farm or in the shop, in the office or in the hustle and bustle of the transportation systems, everywhere, all day and all night, it is the same thing uppermost in the thought of everyone whether they are wearing the mobilization badge or army uniform or not. It pervades every walk of life, high and low, rich and poor. Class distinction seems to be wiped out for the time being as is shown by the respectful and gracious salute that is given by one Frenchman to another, especially to one wearing a uniform and the spirit of camaradis that permeates the army is shown by the close personal affection and affiliation between officers and men. All this in some small measure must account for the wonderful results that are being achieved in this very unusual country, for even France's enemies will admit that France's up-to-date methods has been a wonder and a surprise.

As an evidence of the unpreparedness for war on the part of France and England and as an evidence that they were not looking for nor anticipating war, I might repeat just a few statistics that were given to me and which are extracts from government records and documents:

In England and France they make now each day practically an amount of munition artillery and war material that equals the entire capacity of the respective countries in an entire year at the time war broke out. Just let me repeat that once again, they make in 24 hours for war consumption, material of all kinds equal to the entire year's capacity of these respective countries with the equipment on hand at the beginning of the war.

They have over three million people in France making war material, 3,500,000 in Great Britain and with, through and by the British navy they have 5,000,000 people at work all the time.

They were using at the Somme front shortly before I was there an amount of war material every 30 minutes that equalled all that Great Britain had on hand when the war started.

On the Somme fronts, they consume in three weeks as much amunition and war material as England was able to produce in the first year of the war.

They are sending to France from England about one-third of their entire steel output and much of their pig iron.

They are coming in these countries to make more and more of the smaller material used in the struggle. The smaller shells, rifles and equipment of that character are being made more and more in England and other allied countries. The larger and heavier shells and munitions are still being made in the United States.

In France they think it is a war of steel, a war by steel and a war for steel.

This is explained by the statement that in Germany they produced in 1913 the last year for which we have any statistics, about 19,000,000 tons of steel; in Austria about 2,500,000 tons, making a total steel production in Germany and Austria of about 21,500,000 tons. The United States in that same year produced between 31,000,000 and 32,000,000 tons. Great Britain produced in the year before the war less than 8,000,000 tons; France about 4,500,000, Belgium 2,500,000, making a total steel production in the Allied countries in the West of about 14,500,000 tons.

But, when Germany entered Belgium, she took first the great Belgian steel plants and ore fields and took away from France about 80 per cent of its ore production and about two-thirds of its steel producing capacity so the real situation is something like this. The Central Powers continue to produce the original 21,500,000 tons and in addition produce 2,500,000 in the districts obtained in Belgium and they are producing in the French plants about 2,500,000 tons, which means that the Central Powers are easily producing upwards of 26 or 27,000,000 tons of steel. Great Britain with her original capacity of 7,500,000 and France with about 2,000,000 gives a total of 9 or 10,000,000 tons based upon the 1913 production, leaving the Allied countries in the West with about one-third the capacity of the Central Powers, and as steel is such an important factor in the war, this will account for the large and gradually increasing demand upon the United States for our own iron and steel for use in Europe at this time.

Of course there is plenty of evidence of the extent to which both England and France have increased their steel making capacity and their production of ore being secured from Sweden, Spain and from very large ore deposits in French Algiers, but this has taken time and has left the Allied countries at a serious disadvantage.

One great surprise in this connection is the fact, little known, that in 1913, Russia itself in plants, which are very much larger than is generally realized in America made upwards of 4,500,000 tons of steel and those who are best informed on this subject say that Russia is making arrangements to increase this three-fold and is besides securing large quantities of iron and steel from Japan which now controls the furnaces and steel plants of Hangkow in China.

They have imported thousands of machine tools from this country, thousands of cars and locomotives and large quantities of iron and steel and machinery as well as equipment of every character to say nothing of munition steel, munitions, and other requirements and all this is being utilized to the very greatest advantage in some part of the country.

Wherever munitions or war material are being made the plant is known as being "mobilized" and every man of war age in France who is a Frenchman must be engaged at this particular time if not at the front, in some occupation that is rendered necessary by the existing conflict.

Each soldier of course wears the regulation uniform and the regulation chain bracelet with its small badge giving his number, which is a part of the government's records and when wounded or taken to a hospital or if killed, this furnishes evidence by which his identity, residence, etc., are immediately traced. They have a department connected with the army which promptly notifies the families of soldiers who are killed returning to the family each soldiers equipment and personal belongings.

No one appears to be inqusitive or anxious to know what is being done in any other walk of life other than the one with which he is immediately identified. No one is allowed to visit the plants making munitions of war of any kind and much less is a foreigner granted admission to see what is going on behind the walls of mobilized buildings, but this, owing to Governor Herrick's letters of introduction, was made easy for me and only the proprieties of the existing conditions prevent me from telling you some things that I saw which I think would be exceedingly astonishing.

After the war, the wonderful change that has taken place as far as labor is concerned and as far as the industrial life of

France is concerned is going to exercise an important influence on its future.

Undoubtedly is it true that the necessities of the occasion are compelling the various governments to exercise a greater amount of supervision and regulation over relations between employers and employees, and after the war, the struggle for existence and the effort to repay the large financial obligations that have been incurred are going to continue and in all likelihood increase this measure of regulation and supervision. No one believes for a moment that the position which women have won for themselves as a result of this conflict will ever be relinquished and they will probably never return entirely to their former vocations.

In France, they speak with pride of the fact that they have had no labor disturbances, while in England, as soon as the war began there have been many such conflicts. And, if these countries are going to be able to control the conditions after the war as in a certain measure they are controlling them now and if these countries (as undoubtedly they will be) are able to continue the wonderful industrial efficiency that has come to them as a result of necessity inspried by the present conflict, they are going to enter the arena for the control of the world's trade with renewed energy with relatively small overhead expense and small production cost and with plants which (it is no secret) have from their very inception and erection been so constructed that after the close of the war they can be utilized for the economical and rapid construction of automobiles, sewing machines, agricultural implements and other material, which has been very largely hitherto, imported from America, and they are going to command not only their own trade, but have an advantage in the trade as regards other foreign countries where hitherto the United States has been a large seller.

Every plan, method, arrangement that the government can make to enter into with the business interests of the countries now at war to facilitate their industrial supremacy so far as this country is concerned and also in an effort to control the foreign trade of the world, which is a prize every country goes after with greater energy than we do here, is going to be given and I feel that our own effort will meet with a very severe handicap in those lines in which we have any serious competition.

In addition to that, if as it is anticipated, a tariff of 10 or 20 cents per bushel is placed upon all importations of wheat unless it shall come from countries of the Allies; a tariff of 5 or 10 cents per pound on importations of cotton unless it shall come from countries of the Allies; a tariff of 20, 30, 40 or 50 per cent on machinery, and equipment of all kinds unless from Allied countries and perhaps a further embargo in the way of a preferential duty of perhaps 5 per cent in value and say 1 cent a cubic foot for space occupied on all importations into the Allied countries unless these shall come in ships operated by those countries now known as Allied countries, it will all serve as a protection that will enable them to keep their gold at home, fortify them in their effort to pay the present large indebtedness caused by the war itself.

This is not intended as a policy of recrimination, retaliation or a "trade war" as some of our daily papers point out, but it will be entirely a justifiable and proper plan and no one who has lived in a protected country or a believer in a protective tariff can do otherwise than applaud the effort of these nations, in this direction.

The condition previously referred to with reference to the steel industry furnishes the reason for our large exports of material of that character and also indicates the extent to which Germany strengthened herself by taking the iron and steel plants of both Belgium and France at the beginning of the war and weakened the Allies to just that extent, thus severely handicapping the Allies in a most vital point.

There is a feeling in France that probably from this time forward there will be less destruction of human life, unless there should come some pitched battles of a mammoth character and these apparently it is the desire of both sides to avoid as far as possible.

On the Western front there has been a loss of about 2,000,000, people since the war began or an average loss of about a thousand on each side during each day of 24 hours. As the war has lasted about 800 days, this would easily mean a thousand lives a day on each side at the Western front. This does not take into account the men of whose end they know nothing.

On my visit to the Somme front, I remember seeing just over a gently sloping hillside, back of a large hospital, a field that must have contained a great many hundred of the small crosses newly erected, indicating that the graves had been newly made. The number of the soldier and his name is stencilled on the wood. They take off the dead soldier's wrist-tag and forward it to headquarters, so that graves are very easily located.

I talked with one captain who went with me to the front asking him about how many people were buried in a certain cemetery and he stated, after looking at it for a moment "Oh, about two acres."

At the Somme front, the hospital consisted of about 90 buildings. A few weeks before this great battle started, preparations were made by selecting the ground for hospital buildings on a gently sloping hillside, where the drains were placed and a series of concrete foundations were laid upon which the hospital buildings themselves were then erected.

Everything in the way of buildings used for war purposes is made of an interchangeable, knock-down, and easily erected character. The eaves of the small hospital buildings are about four feet from the ground and from there to the peak of the roof which is about 12 feet high, there is the usual gradual slope. The buildings are about 24 feet wide and can be made any length desired. Everything in connection with the erection of these buildings is arranged so that they can be put up expeditiously and can be taken down equally as rapidly if necessary, as they desire to be able to take down or put up one of these buildings upon the foundations which are all of a similar character, in one to two hours.

They have a splendid operating room, light from three sides and from the room and they have motor trucks especially designed so that they can back up against one of the buildings and by taking down the end, turn the building into a modern X-ray room, the entire X-ray equipment being contained in the motor truck.

As has been stated about one-third of the patients in these hospitals were Germans. The wounded are brought in during the night, for the most part when the cannonading ceases by more or less mutual understanding and it is to be regretted that while in the early part of the war a certain amount of respect was had for the red cross flag, it does not now seem to exist.

In this hospital at Somme, they had taken care of 25,000 patients from the middle of July to the middle of September. They have made about 12,000 operations and about 4,600 X-ray examinations.

The war is certain to result in some wonderful surgical developments. Some extraordinary discoveries have already been made. Those by Dr. Carrell of the Rockefeller Institute being the most generally discussed and frequently referred to and are expected to be of far-reaching value.

Dr. Sherman of the Carnegie Steel Company, at Pittsburgh, who was in France making an investigation on behalf of the Steel Corporation, of the surgical work in order that the corporation might take advantage of any new discoveries in taking care of its own men, stated the work done by Dr. Carrell and the discoveries he had made under the auspices of the Rockefeller Institute, which has been financed by Mr. John D. Rockefeller gave him the distinction of having done as much as if not more in his judgment for the human race, than any wealthy man who has ever lived.

I heard Dr. Sherman say that while 40,000 had lost their legs in France, if the Carrell discoveries could have been used promptly at the time, probably not more than a thousand amputations would have been necessary. The French Chamber of Deputies has taken this matter up and I understand is going to insist that every hospital be fully equipped with the Carrell appliances and that this method should be universally adopted in all surgical work where it can possibly be used.

I wish to speak a word further before I close concerning the probably commercial and industrial condition in the countries at war after the conflict is over.

No one of course knows just exactly what is likely to come in that connection, but there are some pretty generally understood conclusions already that the governments are going to take a more strong and active position in support of and to protect their national industries and aid in every way the securing of as much of the foreign trade of the world in order that they may balance up their gold supply and be in a position to pay the terrible debts incurred.

Already they have been having economical conferences, the result of which is being felt and as in Europe they do not have to submit the conclusions to respective parliaments or political parties for approval the government is authorized to make regulations of a mandatory character and report afterwards, no one can foresee just what the result is likely to be.

But, one thing is sure and that is they will not import from this or any other country a dollars worth of material more than will be absolutely necessary and with the aid of their large merchant marines they are going to control and regulate very large imports and exports.

The effect that this will have on this country is difficult to foretell. We are not the only country that is not in the war. South America, South Africa and the Orient have all a large trade that will be desirable and with the wonderful efficiency, both in manufacturing, exporting and water transportation systems, possed by European countries, America is going to feel a degree of competition that we do not at this time realize.

The postoffice departments at the front are very wonderful. They receive over 500,000 letters a day for distribution to soldiers at the front, and from the soldiers they receive an equal number which are sent to the families, which by government regulation require no postage. They also receive about 50,000 letters a day from soldiers at the front to other soldiers upon which no postage is required. The postoffice department has an accurate record of the location of each regiment and each company each day, and when a change in position is made notification is sent to the postoffice department.

When writing to a soldier you have to place on the envelope the number of his regiment, as well as his own number, and if he is alive, that letter will reach him within a very few hours after it is in France.

The French people pride themselves on never allowing any parades of prisoners, while there are picture shows in existence showing the prisoners of the Allies being marched through the streets of Berlin and other German cities, but the French never humiliate a German prisoner in that or any other way. They have a very unusual rule that nothing can be said to a German prisoner that will in any way annoy or embarrass him.

In conclusion I just wish to emphasize the points made earlier, that in France they are resigned and determined to continue this struggle to the bitter end. Each soldier has made up his mind that he is going through with whatever may be assigned to him to the last hour and you read many instances in France about the desire of the wounded soldier being anxious to recover his health for only one thing, namely that he may get back to the front as soon as possible. It has become a religion with them. It is a mania and there appears to be no hesitation and no halting.

This spirit is typified wonderfully in a few lines which I wish to repeat and which I think will make an appropriate close to what I have been permitted to say to you this evening:

If you are a Frenchman, two things are certain:
Either you are mobilized or you are not mobilized,
And if you are not mobilized—why worry;
And, if you are mobilized, two things are sure,
Either you are in the trenches or you are not in the trenches;
And if you are not in the trenches—why worry;
And, if you are in the trenches, two things are sure,
Either you are wounded or you are not wounded,
And, if you are not wounded, why worry;
And, if you are wounded two things are sure,
Either you are slightly wounded, and if so—why worry;
And if you are severely wounded, two things are sure,
Either you will recover and if you will recover—why worry;
Or, if you will die—and you cannot worry.

MR. FRANK J. LANAHAN: I move you that the Railway Club extend to Mr. Penton for his interesting, instructive and intelligent talk this evening a vote of thanks in recognition of his kindly courtesy in sacrificing another engagement to come to us tonight, and that the vote be taken in the form of a rising vote.

PRESIDENT CODE: Just a moment. One of our own members, an officer of the Club, has recently returned from the front, where he went as did the boys in blue in 1861 and in 1898, and where he has performed all the service of a soldier except fighting although he went there prepared to fight, and that is not the hardest part of a soldier's duty. I ask you to greet Lieutenant Harry Howe.

LIEUT. HARRY HOWE: Mr. President and fellow members of the Railway Club of Pittsburgh:—It has been my privilege, and I count it a privilege, to study the fighting game for the last five months as hard as any man can, and it has done me good. The man who has been down on the border for five months and has not come back a bigger broader man has missed the opportunity of his life. And the man who has not come back better physically has done so because he has not behaved himself while he was down there. And the man who has not learned a lot about what we need to know has missed a great deal.

Mr. Penton spoke about the wonderful cooperation, the marvelous spirit of patriotism that is evident in France. To our shame be it said, that spirit is somewhat lacking in America. I found that before we left. I found our young men reluctant to go. When we were appealing for recruits and were expecting to go to the front, the call was for service, not for a pleasure trip. Every man who went to the border expected to go across the border when he went down. Some of us did not want to go across, at once realizing how little ready we were to go across. And we came to feel what Mr. Penton has spoken about, namely the commercial war, if you will, that is to come when this present war ends, that some of the golden war accumulations in this country today are being accumulated at the expense of our own resources. Men who have been at the border for months are not yet equipped as they should be should they be called on for active service. They have guns, yes, they have everything they need to fight with, but they have nothing to follow it up. They do not have clothes enough. The complaints that come from the border about the lack of clothes to keep the men warm are somewhat true. Of course they are always exaggerated. But when you think of a climate as it is down there that at noon the day I left was 80 degrees and possibly higher, and at night was down to 18 degrees, you will realize that it is some country to summer in. Add to that the dust they get around there as thick as any snow storm you ever saw for hours and hours together, and it is some country to soldier in. And when you realize that they probably do not have clothes enough and that a pair of shoes do not last long out on a hike, I wonder sometimes if we have not sold some of our shoes and blankets and clothing to the people across the pond and whether we will not have to buy them back again when we need them a little more than we do just now.

When I think that it took us five days to get from here to the border and an ordinary passenger train does it in three, I wonder if there is not a lack of some preparation. And when it took us six days to come back from the border, and from nine o'clock at night at Fort Wayne until 2:30 the next afternoon to reach Pittsburgh, I begin to wonder if there is not some lack. I am talking to a railway club and I wonder if we could not get a few more railroad men in the service, particularly in the quartermaster's department, if we would not be better off on the question of transportation.

What we need more than anything else in this country is a unity of spirit, the new spirit that does exist unquestionably in France. They have democracy enough in every sense and there is nothing in the world to which that democracy is primarily more attributable than to the practically uniform military service that every man there undergoes. I do not believe that France is any more bloodthirsty than we are. I do not believe military training will make a man bloodthirsty. I believe if anything it will tend to keep him out of war. But if we should ever have to go (and my personal opinion is that it will not be six months before we go again and then we will go right) men who are prepared will have a better time that the men who are unprepared. And should we go there is going to be a big job, a job that will take a lot more men than we have ready now. I suppose there are not over 200,000 men at present trained in this country for the service of war. And it is going to take a lot more men than that to do the job that is to be done on the other side of the Rio Grande. It will be the biggest thing that any man can have a part in from the standpoint of humanity. If I could picture to you the stories that have been brought to me first hand from Juarez just across the Rio Grande from El Paso (and those fellows in Mexico really are fighting among themselves) you would realize that it will take a strong hand all sorts of power to put down these factions. Children, women and men, all coming in, as refugees from the states of Mexico where the war is being carried on at present between the factions with practically no clothes to cover them. Imagine people digging holes in the ground and covering the hole with a piece of sacking and twelve or fifteen people huddling in those holes for warmth in the night time to keep body and soul together. It is a thought to carry away with us. The work the United States did in the Philippines and in Cuba is only a kindergarten lesson compared with what is to be done in Mexico. A lot of us believe that when the people across the pond have their personal troubles settled they are going to demand of the United States that we do better than we have been doing and do what they want done and they will do it if we do not do it for them.

We insist in upholding the Monroe doctrine on this Continent and if we will not permit them to police a country to enforce the rights of their citizens in that country we must do it for them. And we will insist unquestionably that no armed power but our own will invade any South America country. I can not say that I hope to go down there, but when the call comes I will be as ready as I ever was if they will just let me stay home until after Christmas.

MR. D. J. REDDING: We can not hope to adequately thank Mr. Penton for the work he has done for us tonight, but there is one thing we can do and that is to make him an Honorary Member of the Club, and I move that such action be now taken.

The motion was carried by unanimous vote.

A rising vote of thanks was extended to Mr. Penton and Lieutenant Howe for their interesting remarks.

ON MOTION, adjourned.

J.B. Anderson
Secretary.

RAILWAY CLUB NOTES.

The following subjects were presented and discussed by the several Railway Clubs during the month of November, 1916, as noted below:

New York Railroad Club, Harry D. Vought, Secretary,
95 Liberty Street, New York, N. Y.

SUBJECT—"Water Powers of Canada" by L. A. Armstrong.

New England Railroad Club, Wm. E. Cade, Jr., Secretary,
683 Atlantic Avenue, Boston, Mass.

SUBJECT—Address by Howard Elliot.

Canadian Railway Club, Jas. Powell, Secretary,
P. O. Box 7, St. Lambert, near Montreal, Can.

SUBJECT—"Pulverized Fuel for Locomotives" by J. S. Coffin, Jr.

Richmond Railway Club, F. O. Robinson, Sec'y, Richmond, Va.

SUBJECT—Annual Meeting.

St. Louis Railway Club, B. W. Frauenthal, Secretary,
Union Station, St. Louis, Mo.

SUBJECT—"Mechanical Stokers for Locomotives" by W. S. Bartholomew.

Southern & South Western Ry. Club, A. J. Merrill, Secretary,
Box 1205, Atlanta, Ga.

SUBJECT—"Fire Prevention."

Central Railway Club Buffalo, N. Y., Harry D. Vought,
Secretary, 95 Liberty Street, New York, N. Y.

SUBJECT—"Locomotive Fule Economy and Drafting of Locomotives" by D. R. McBain.

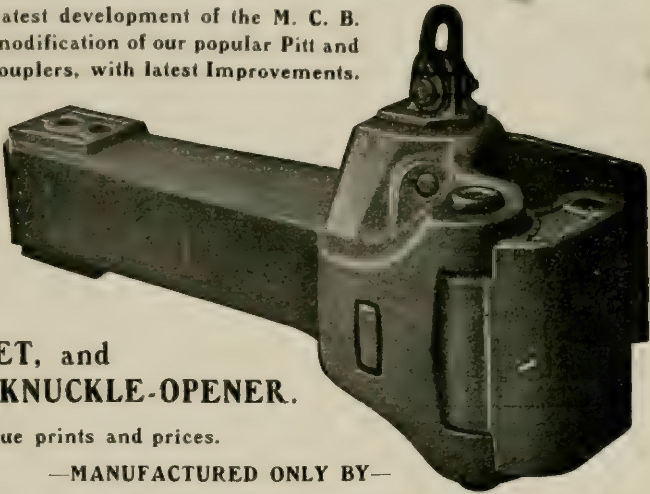
The Railway Club of Pittsburgh, J. B. Anderson, Secretary,
207 Penna. Station, Pittsburgh, Pa.

SUBJECT—"Observations—Operation of Transportation Facilities and Manufacturing Activities in the Verdun Region" by John A. Penton.

Copies of the above papers can be had upon application to the Secretary at the address given for a nominal price.

THE PENN COUPLER

Our latest development of the M. C. B. Coupler, a modification of our popular Pitt and Janney X Couplers, with latest Improvements.



LOCK-
TO-
THE-
LOCK,

LOCK-SET, and
KNUCKLE-OPENER.

Send for blue prints and prices.

—MANUFACTURED ONLY BY—

THE McCONWAY & TORLEY CO.,
PITTSBURGH, PA.

This Space For Sale

PINTSCH MANTLE LIGHT

The system that has made good wherever it has been applied . . . .

SAFETY ELECTRIC LIGHT

Type "F" regulation ensures constant lamp voltage and long lamp life .

The Safety Car Heating & Lighting Co.

Chicago, Philadelphia, Washington, Boston,
St. Louis, San Francisco, Montreal

2 Rector St., New York

KING
METALLIC PACKINGS

for Locomotive Piston Rods, Valve Stems & Air Pumps

SECURITY WRIST PIN
LEACH SANDERS
GOLLMAR BELL RINGER
INDESTRUCTIBLE OIL CUP
BRAIDED SWAB, ETC.

The U. S. Metallic Packing Co.
PHILADELPHIA

FIREBOX FACTS

1. Big locomotives have long wheel bases.
2. Long wheel bases must be covered by long boilers.
3. Long boilers mean excessive flue lengths.
4. Excessive flue lengths represent investment in heating surfaces of low evaporative values.
5. Shorter flues mean longer fire boxes.
6. Longer fire boxes (with combustion chambers) of the radial stay type are dangerous and introduce added stay bolt troubles.
7. The Jacobs-Shupert sectional fire box (and combustion chamber when required) supplies the means for designing locomotive boilers of correct economic proportions and at the same time for reducing maintenance problems to a minimum.

"YOURS FOR BETTER BOILERS"

Jacobs-Shupert U. S. Firebox Co.

30 Church St., New York. Works: Coatesville, Pa.

RAILWAY STEEL-SPRING COMPANY,

Springs,
Steel Tired Wheels,
Locomotive and Car Wheel Tires.

GENERAL OFFICE, 30 CHURCH STREET, NEW YORK
BRANCH OFFICES:—CHICAGO, ST. LOUIS. ST. PAUL, WASHINGTON, D. C.

This Space For Sale

STANDARD STEEL CAR COMPANY

OFFICES General Offices: Frick Bldg., PITTSBURGH, PA.
NEW YORK: 170 Broadway
CHICAGO: Fisher Building

WORKS BUTLER, PA.
NEW CASTLE, PA.
HAMMOND, IND

STEEL AND COMPOSITE

FREIGHT CARS

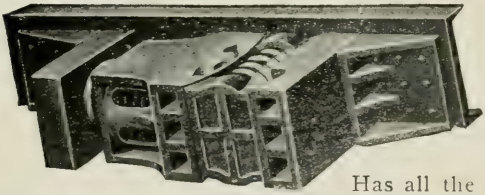
For all Classes of Service, from our Standard Designs, or according to Specifications of Purchasers.

Steel Car Underframes

TRUCKS, BOLSTERS, BRAKE BEAMS, ETC.

Capacity 50,000 Cars per Annum

INQUIRIES SOLICITED



USE BUTLER DRAFT GEARS

FRICTION RIGGING

PIPER PATENTS

200,000 lbs. Capacity.

Has all the points of a Perfect Gear.

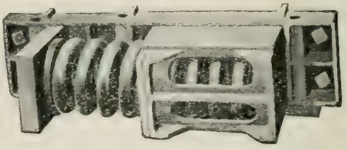
TANDEM SPRING ATTACHMENTS

6¼x8 or 8x8 DRAFT SPRINGS

PERFECT SPRING PROTECTION

Butler Drawbar Attachment Co.

Send for Catalog CLEVELAND, OHIO



SCHAEFER

DROP-FORGED

FOUNDATION BRAKE GEAR DETAILS,

COMBINE

MORE STRENGTH WITH LESS WEIGHT

Schaefer Equipment Company

Oliver Building Pittsburgh, Pa.

STANDARD STEEL PLATFORMS
ARE IN USE BY 281 COMPANIES
SESSIONS—STANDARD FRICTION DRAFT GEARS
ARE IN USE BY 205 COMPANIES
—BOTH MADE BY—
THE STANDARD COUPLER CO.
CHICAGO: People's Gas Building NEW YORK: 30 Church St.

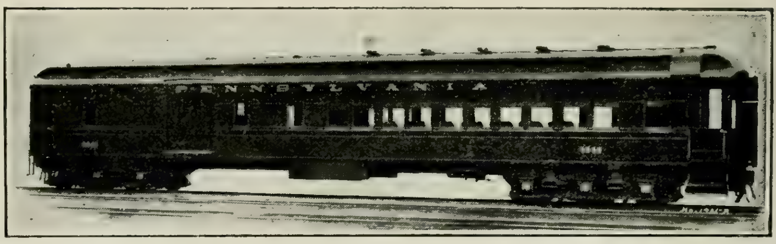
J-M RAILROAD SUPPLIES

Roofings
Packings
Gaskets
Pipe Coverings
Hair Felt
Smoke Jacks
Asbestos Wood
Waterproofing
Cork
Fibre Conduit
Locomotive Lagging
Flexible Armored Squirt, Tank, Car Heating, Air Brake and Air Signal Hose
Air Brake Expander Ring
Steel Car Insulation
Underground Conduit
Asbestos Cements
Brake Lining and Blocks
Electrical Supplies
Mastic Flooring
Speedometers
Fire Extinguishers
Manual Slack Take Up for Air Brakes
Vitribestos Stack Lining
Refrigerator Car Insulation

Write for Catalogs
H. W. JOHNS-MANVILLE COMPANY
New York and Every Large City

Union Steel Casting Company,
PITTSBURGH, PA.
Steel Cast Locomotive Frames, Driving Wheel Centers, and Miscellaneous Locomotive Castings.
Vanadium Steel Castings a Specialty

Standard Heat & Ventilation Co. Inc.
Heating Apparatus for Railway Cars and Locomotives
Car Ventilators, Storage Battery Charging. Plugs and Car Receptacles.
165 Broadway New York



Freight and Passenger
CARS
Of Every Description

Pressed Steel Specialties

Tank Cars Mine Cars

Pressed Steel
Car
Company

New York Pittsburgh Chicago St. Paul

FOR

GREATER EFFICIENCY

USE

DAVIS SOLID-TRUSS BRAKE BEAMS

FOR

Freight and Passenger Equipment.

ALSO

Pressed Steel Journal Box Lids.

DAVIS BRAKE BEAM CO.,

JOHNSTOWN, PA.

FRANK J. LANAHAN, Pres. CHAS. J. GRAHAM, Vice-Pres. H. L. REPLOGLE, Gen'l. Sales Rep.

STUCKI
Side Bearings
SAVE WHEELS, RAILS, POWER
AVOID DERAILMENTS

A. Stucki Co.
Oliver Building
PITTSBURGH,
PA.

The "STA-RITE"
CAR CURTAINS AND FIXTURES

MAKE THE BEST

ARE FOOL PROOF!

No Attention—No Worry—Are Right—Stay Right.

Pittsburgh Agent:
S. M. Hindman
Oliver Building.

THE RAILWAY SUPPLY & CURTAIN CO.
612-618 South Canal St., Chicago

This Space For Sale

SUYDAM'S Protective PAINTS
For Freight Cars and Structural Steel Work
MANUFACTURED BY
M. B. SUYDAM COMPANY,
OFFICE AND WORKS, 61ST AND BUTLER STS.,
BELL 'PHONE, 343 FISK. PITTSBURGH, PA

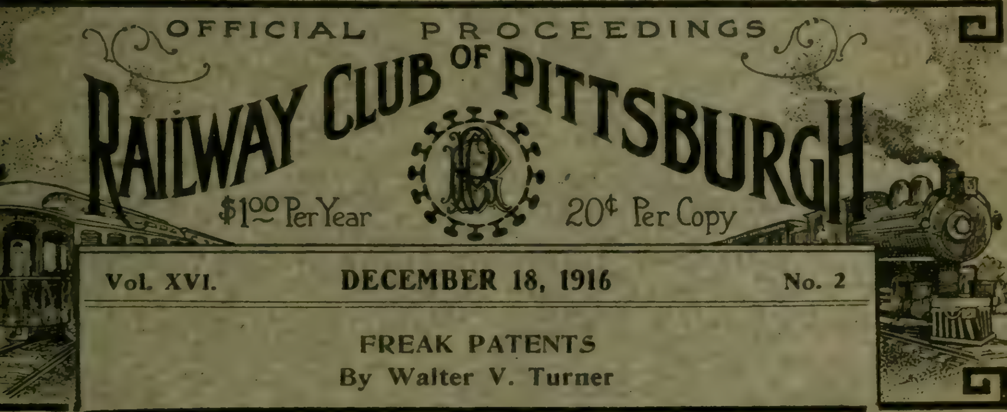
This Space For Sale.

[illegible] Library
of Pittsburgh

FOR SALE

BRADY BRASS CO.
MANUFACTURERS OF
CYPRUS BRONZE FOR LOCOMOTIVE and CAR BEARING USE
ENGINE CASTINGS BABBITT METALS
JOURNAL BEARINGS MOTOR BEARINGS
General Office and Works, 170-182 Fourteenth St. and 169-175 Fifteenth St., Jersey City, N. J.
DANIEL M. BRADY, President

SCHMIDT SUPERHEATER LOCOMOTIVES
Make firing easier Save coal and water
Haul longer trains Maintain faster schedules
LOCOMOTIVE SUPERHEATER COMPANY
30 Church St., New York. Peoples Gas Bldg., Chicago.



OFFICIAL PROCEEDINGS
RAILWAY CLUB OF PITTSBURGH
$1.00 Per Year 20¢ Per Copy
Vol. XVI. DECEMBER 18, 1916 No. 2

FREAK PATENTS

By Walter V. Turner

Light Drop Forgings
STEEL CAR FORGE COMPANY
"FORGING SPECIALISTS"
PITTSBURGH NEW YORK CHICAGO

FOR SALE

Electrical Uses
ARISTOS
"COPPERWELD"
Mechanical Uses
A COPPER CLAD STEEL WIRE
Product of the COPPER CLAD STEEL CO., Pittsburgh, Pa.
Drawn and Sold Exclusively by
PAGE WOVEN WIRE FENCE CO., - - Monessen, Pa.

FOR SALE

TORCHES

Gem Torches Save You Money

Exhaustive tests by largest railway systems have proven that Gem Brazed Seam Torches do save money. Let us prove it. Send for free sample and information.

Gem Manufacturing Company
PITTSBURGH, PA.

Graham Nut Company
PITTSBURGH, PA.
MANUFACTURERS OF

Hot Pressed Nuts, Cold Punched C. & T. Nuts
Bolts, Lag Screws, Washers, Etc.

This Space For Sale

BETTER BEARINGS

for cars and locomotives and machinery.

Better bushings for high speeds.

Better facilities in our new plant.

Better prices on your bearing and bushing requirements.

Send blue prints and specifications to Dept. R. C. for quotations.

Johnson Bronze Co.

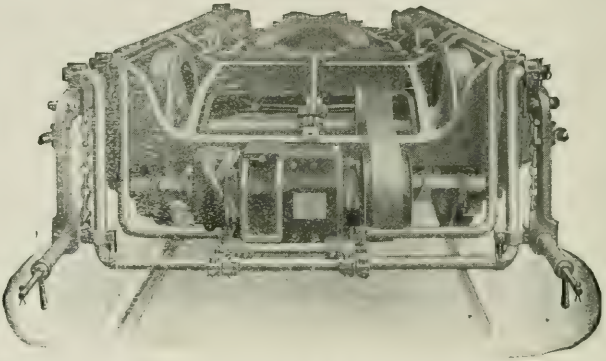
Formerly American Car & Ship Hdwe.
Mfg. Co.

New Castle, Pa.

Sales Offices:
New York, Buffalo,
Cleveland, Chicago.
Cincinnati, Detroit,
San Francisco

THE GOULD "SIMPLEX" SYSTEM OF

ELECTRIC CAR LIGHTING

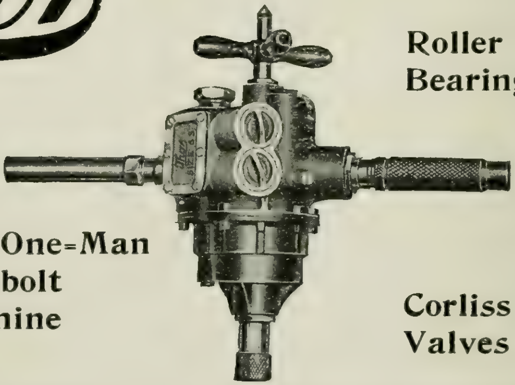


GOULD COUPLER CO.

NEW YORK

Thor

Roller-Bearing Compound
Piston Air Drills



Roller
Bearings

No. 32
L

The One-Man
Staybolt
Machine

Corliss
Valves

FURNISHED ON TRIAL FREE. WRITE NEAREST BRANCH

INDEPENDENT PNEUMATIC TOOL COMPANY

Chicago : New York : Pittsburgh : Detroit : San Francisco : Birmingham : Montreal, Que.

MANNING, MAXWELL & MOORE,

ROBT. A. BOLE, MANAGER, PITTSBURGH BRANCH

PARK BUILDING

LONG DISTANCE TELEPHONE CALL. GRANT 67

Railway and Machinists' Tools and Supplies, Electric Traveling Cranes, Compressors, Pneumatic Hoists, Riveters and complete Machine Shop and Foundry Equipment

---

NATIONAL CAR WHEEL COMPANY

MANUFACTURERS OF

"STAR SPECIAL"

Reg. U. S. Patt. Off.

CHILLED CAST IRON CAR WHEELS

WORKS:
Rochester, N. Y. Pittsburgh, Pa.
Sayre, Pa. Cleveland, O.
New York City, N. Y.

General Offices:
PITTSBURGH, PA.
New York Office:
556 WEST 34th STREET
Phila. Office:
506 FRANKLIN BANK BLDG.

BRAKE SHOES

AMERICAN BRAKE SHOE AND FOUNDRY COMPANY

MAHWAH, N. J.

NEW YORK
30 CHURCH ST.

CHICAGO
332 SO. MICHIGAN AVE.

This Space For Sale

NATHAN MANUFACTURING CO.
101 PARK AVE. NEW YORK

1612 Old Colony Building, Chicago.

Monitor, Simplex and Nathan Injectors for Locomotives

AND

Sight-Feed Lubricators.

All Specially arranged for High-Pressure Engines.

STEAM FIRE EXTINGUISHERS FOR SWITCHING AND YARD ENGINES.

Boiler Washers, Boiler Testers, Rod and Guide Oil Cups, Etc.

—— *SOLE AGENCY FOR THE* ——

Coale Muffler & Safety Valve Co., Inc.

SIPE'S No. JAPAN OIL
TRADE MARK REGISTERED
J.B. SIPE & CO.
MANUFACTURERS.
ALLEGHENY, PA.

ESTABLISHED 1884

SIPE'S JAPAN OIL

"STRENGTHENS, DRIES, AND WATERPROOFS;

Add Sipe's Japan Oil And Improve the Paint".

IN DAILY USE BY ALL THE LEADING RAILROADS IN THE UNITED STATES

MANUFACTURED ONLY BY

CHICAGO ILL. **JAMES B. SIPE & CO.** PITTSBURGH, PA.

LOCOMOTIVE BLOW-OFF

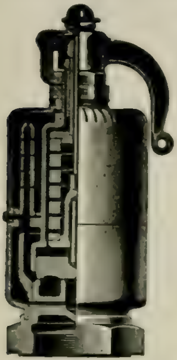
DOES SATISFACTORY WORK ON MANY ROADS.

Can be worked from cab or foot board while running.

A catalog or call by Representative for the asking.

Homestead Valve Mfg. Co.,

Works: Homestead, Pittsburgh, Pa.



CROSBY STEAM GAGE & VALVE CO.

Standard Locomotive Specialties
Make a Perfect Equipment.
Crosby Locomotive Pop Safety Valves,
Plain or Muffled.
Crosby Steam Pressure and Duplex Gages.
Crosby Counter and Pressure Recorders.
ORIGINAL Single Bell Chime Whistles.
Johnstone Blow-off Valves.
CROSBY STEAM ENGINE INDICATOR,
with Sargent's Electrical Attachment for taking any number of diagrams simultaneously.
MAIN OFFICE AND WORKS, BOSTON, MASS.
Stores: Boston, New York, Chicago and London, England.
Send for Catalogue and Prices.

BALL'S
VARNISH REMOVER

OXOLIN
REGISTERED
THE IDEAL PAINT OIL

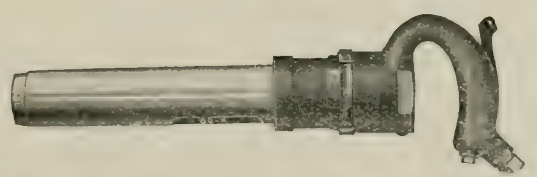
B. C.
SPIRITS

Ball Chemical Co.

CHICAGO Office,
63 W. Van Buren Street.

Fulton Bldg., PITTSBURGH, PA.

Logical Construction
is a feature of
BOYER
Pneumatic Hammers



No. 80X Boyer Riveting Hammer. Capacity 1⅜ inches.
Length overall only 21⅜ inches.

Boyer Hammers are made in three parts, cylinder, handle and valve—a construction which facilitates examination, cleaning and repairs, and extends the life of the tool indefinitely.

Write for Hammer Bulletin 124.

CHICAGO PNEUMATIC TOOL CO.

PITTSBURGH: 10 and 12 Wood St

1052 Fisher Bldg.
CHICAGO

Branches Everywhere

52 Vanderbilt Ave.
NEW YORK

H. H. HEWITT, PRESIDENT. W. H. CROFT. VICE-PRESIDENT

MAGNUS METAL

MEETS ALL HIGH-GRADE REQUIREMENTS.

IT IS THE STANDARD METAL

FOR LOCOMOTIVE WEARING PARTS,

JOURNAL BEARINGS FOR { FAST PASSENGER CAR SERVICE,
HEAVY FREIGHT CAR SERVICE.

MAGNUS COMPANY

111 BROADWAY, NEW YORK.

DURABILITY COUNTS

DIXON'S SILICA GRAPHITE PAINT

is the "LONGEST SERVICE" paint. Recommended and largely used as standard by railroad economists, and engineers, throughout the entire world, for bridges, steel cars, tanks, signal apparatus etc. Made in FIRST QUALITY only. Write us for long service records and booklet No. 152-B.

Made in JERSEY CITY, N. J., by the

JOSEPH DIXON CRUCIBLE COMPANY

ESTABLISHED 1827

RAILWAY SPECIALTIES

The National Malleable Castings Co.

CLEVELAND, CHICAGO, INDIANAPOLIS, TOLEDO,
SHARON, PA. MELROSE PARK, ILL.

MALLEABLE IRON AND STEEL CASTINGS

PEERLESS Throttle Valve Packing

combines long fibre, braided asbestos with an efficient and lasting lubricant. The core is RAINBOW compound and the packing is graphited, extremely durable and efficient.

In rings, eight to the set. State Dia. Rod, I S. Dia. and Depth of Stuffing Box.

PEERLESS RUBBER MFG. CO.

31 Warren Street, New York

The Air Brake Game

today is a complicated one—and is growing more so daily. No longer will one general rule fit all cases—each individual case is a problem in itself, and as such must be met and solved. Our Engineering organization combines the experience of all railroad air brake engineers and, therefore, is specially fitted to take up and solve any and all air brake problems. Their services are free to our customers, who are requested to call them in on all air brake work, whether it be new specifications, modification of old equipment, or just ordinary, plain, every-day troubles.

Westinghouse Air Brake Co.

General Office, Wilmerding, Pa.

New York, City Investing Building; Pittsburgh, Westinghouse
Building; Chicago, Railway Exchange Building;
St. Louis, Boatmen's Bank Building.

Westinghouse
Electric Arc Welding Outfits

have reduced the repair costs in many railroad shops.
They save their cost in three months time.
Full information on request.—Booklet 3049-A.

Westinghouse
Electric Motors for Railroad Shops

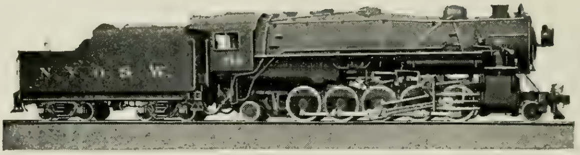
Pressed-Steel Types for either alternating or direct current. Rugged, serviceable, efficient and long lived.
Full information on request.

Westinghouse Electric & Manufacturing Co.

Sales Offices In All
Large American Cities

EAST PITTSBURGH
PENNSYLVANIA

2-10-2 TYPE LOCOMOTIVES



Total Weight of Engine, 352,500 pounds; Weight on Drivers, 293,000 pounds; Diameter of Drivers, 57 inches; Tube Length, 17 feet; Boiler Pressure, 190 pounds; Cylinders, 28x32 inches; Maximum Tractive Power, 71,200 pounds.

Because of its long rigid wheel base many railroad officials have had to eliminate the 2-10-2 type when considering more powerful locomotives.

Lateral motion driving axles and boxes were applied to the New York, Ontario & Western, 2-10-2 type locomotives to reduce the rigid wheel base to that which is in common use on Consolidation and Mikado type locomotives, and at the same time secure the advantages of the ten-coupled wheel arrangement with the resulting increased capacity of the locomotives.

Write us for further information regarding the lateral motion device

AMERICAN LOCOMOTIVE COMPANY

30 CHURCH STREET, NEW YORK

YOU GET THE MAXIMUM OF DURABILITY FROM OUR

SEMAPHORE ENAMEL

All colors—Write to us for samples.

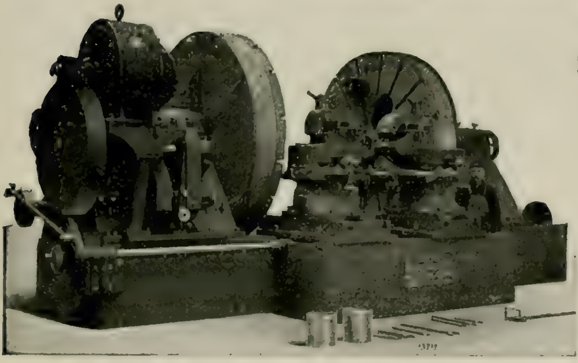
Yarnall Paint Company

MANUFACTURERS - - - PHILADELPHIA

This Space For Sale

Railroad Repair Shop Equipment

**Combining all modern features for
rapid, convenient operation.**



Niles New Model Driving Wheel Lathe
Has broken all wheel shop records.

MACHINE TOOLS

STEAM HAMMERS

ELECTRIC
TRAVELING
CRANES

P. & W.
SMALL TOOLS
AND M. C. B.
GAUGES

WRITE FOR CATALOGUE

NILES-BEMENT-POND CO.

111 Broadway, New York. Pittsburgh Office, Frick Building.

Making Thermit Weld Without Removing Frame

Welding Frames In Place

With Thermit

Saves Time and Money

The mechanical officials of 420 Railroad Shops are saving thousands of dollars every year using "Thermit" for welding their broken engine frames in place, and are returning their engines to service in from 10 to 24 hours.

If you are not using **Thermit** in **YOUR** shop you are not taking advantage of the great saving that **Thermit** can effect.

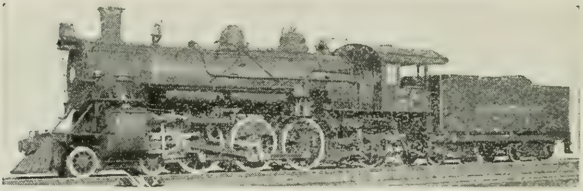
Our new pamphlet 2167 will describe and illustrate what **Thermit** is doing for others. Shall we send it?

Goldschmidt Thermit Company

WILLIAM C. CUNTZ, General Manager

120 BROADWAY, NEW YORK
103 Richmond St. W., Toronto, Ont. 329-333 Folsom St., San Francisco
7300 S. Chicago Ave., Chicago

THE BALDWIN LOCOMOTIVE WORKS
PHILADELPHIA, PA., U. S. A.



LOCOMOTIVES
OF EVERY DESCRIPTION
Electric Motor and Trailer Trucks

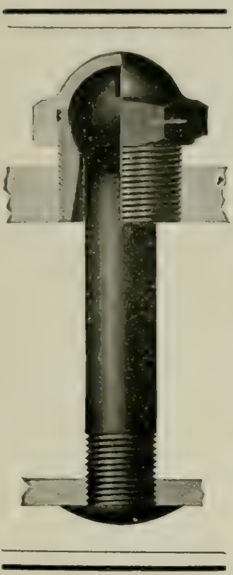
SECURITY
SECTIONAL ARCH

Makes staybolt inspection easy.
Saves flue troubles.
Reduces engine failures.
Easy to apply and remove.
Small brick of light weight.
Cools off quickly.
Many other good features.

AMERICAN ARCH COMPANY

30 Church Street,
New York

McCormick Building,
Chicago



The Best Staybolt
FOR LOCOMOTIVE FIREBOXES

Railroads Are Now Using
The Tate Flexible Staybolt
At the Rate of
1,250,000 A YEAR

Our Services Are Always
At Your Command

FLANNERY BOLT CO.
Vanadium Building
PITTSBURGH, PENNA.
B. E. D. Stafford, General Manager

J. Rogers Flannery & Co.
SELLING AGENTS
Vanadium Building
PITTSBURGH, PENNA.

This Space For Sale

HUNT-SPILLER IRON
HAS THE
STRENGTH AND WEARING QUALITIES
THAT ARE ABSOLUTELY NECESSARY IN
LOCOMOTIVE CASTINGS
PRICES MODERATE RESULTS GREAT
Manufactured Only By
Hunt-Spiller Manfg. Corporation
W. B. LEACH, President and Gen'l Manager.
J. G. PLATT,
Sales Manager.

OFFICE AND WORKS:
383 DORCHESTER AVENUE
SO. BOSTON, MASS.

GALENA-SIGNAL OIL COMPANY

FRANKLIN, PENNA.

Sole manufacturers of celebrated

GALENA LUBRICANTS

PERFECTION VALVE and SIGNAL OILS

and

Galena Railway Safety Oil

Manufactured for

STEAM AND ELECTRIC RAILWAY USES EXCLUSIVELY

Guaranteed Cost **Expert Service Free**

CHARLES MILLER,
Chairman.

S. A. MEGEATH,
President.

FORT PITT MALLEABLE IRON CO.

PITTSBURGH, PENNA.

MANUFACTURING SPECIALISTS
OF MALLEABLE CASTINGS
FOR THE RAILROAD AND
CAR COMPANY TRADE.

FEATURES

Superior Quality

Expeditious Delivery

Consistent Price

INDEX—ADVERTISERS.

NAME	Page
American Arch Co.	x
American Brake Shoe & Foundry Co.	iii
American Locomotive Company	viii
Baldwin Locomotive Works	x
Ball Chemical Co.	v
Brady Brass Co.	Front Cover
Butler Drawbar Attachment Co.	xviii
Chicago Pneumatic Tool Co.	v
Crosby Steam Gage & Valve Co.	v
Davis Brake Beam Co.	xxi
Dixon, Jos., Crucible Co.	vi
Flannery Bolt Co.	xi
Fort Pitt Malleable Iron Co.	xii
Galena Signal Oil Co.	xii
Gem Manufacturing Co.	Front Cover
Goldschmidt Thermit Co.	ix
Gould Coupler Co.	ii
Graham Nut Company	Front Cover
Homestead Valve Mfg. Co.	iv
Hunt-Spiller Mfg. Co.	xi
Independent Pneumatic Tool Co.	ii
Jacobs-Shupert U. S. Fire Box Co.	xvi
Johns-Manville Co.	xix
Johnson Bronze Co.	i
Locomotive Superheater Company	Front Cover
Magnus Company	vi
Manning, Maxwell & Moore	iii
McConway & Torley Company	xv
Nathan Manufacturing Co.	iv
National Car Wheel Co.	iii
National Malleable Castings Co.	vi
Niles-Bement Pond Co.	ix
Page Woven Wire Fence Co.	Front Cover
Peerless Rubber Mfg. Co.	vi
Pressed Steel Car Co.	xx
Railway Steel Spring Co.	xvi
Safety Car Heating & Lighting Co.	xvi
Schaefer Equipment Co.	xviii
Sipe, James B., & Co.	iv
Standard Coupler Co.	xix
Standard Heat & Ventilation Company, Inc.	xix
Standard Steel Car Co.	xviii
Steel Car Forge Co.	Front Cover
Stucki Co., A.	xxi
Suydam, M. B. Co.	Back Cover
The U. S. Metallic Packing Co.	xvi
Union Spring & Mfg. Co.	xiv
Union Steel Casting Co.	xix
Westinghouse Air Brake Co.	vii
Westinghouse Electric & Mfg. Co.	vii
Yarnall Paint Co.	viii

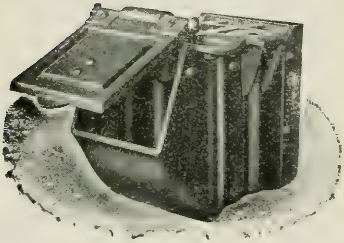
Union Spring & Manufacturing Co.

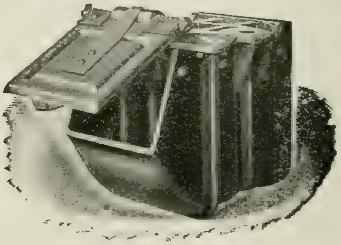
SPRINGS

Kensington All Steel Journal Boxes

PRESSED STEEL JOURNAL BOX LIDS

STEEL CASTINGS





**Lightest and Strongest M. C. B.
Journal Boxes Made.**

WORKS:

NEW KENSINGTON, PA.

GENERAL OFFICE:

First National Bank Bldg., Pittsburgh, Pa.

NEW YORK - 50 Church Street.
CHICAGO - Fisher Building.
ST. LOUIS - Missouri Trust Building.
RICHMOND, VA., AMERICAN NATIONAL BANK BUILDING.
LOUISVILLE, KY., 42 Todd Building.

OFFICIAL PROCEEDINGS
OF
The Railway Club of Pittsburgh

Organized October 18, 1901.

Published monthly, except June, July and August, by The Railway Club of Pittsburgh, J. B. Anderson, Secretary. General Offices, Penna. R. R., Pittsburgh, Pa.

Entered as Second Class Matter February 6, 1915, at the Postoffice at Pittsburgh, under the Act of March 3, 1879.

VOL. XVI.
No. 2.

Pittsburgh, Pa., Dec. 18, 1916.

$1.00 Per Year
20c Per Copy

OFFICERS FOR 1916—1917

President
J. G. CODE,
General Manager, W. P. T. R. R.,
Pittsburgh, Pa.

First Vice President
H. H. MAXFIELD,
Supt. Motive Power, P. R. R.,
Pittsburgh, Pa.

Second Vice President
D. M. HOWE,
Paint Expert,
Pittsburgh, Pa.

Secretary
J. B. ANDERSON,
Chief Clerk, Supt. M. P., P. R. R.,
Pittsburgh, Pa.

Treasurer
F. H. STARK,
Genl. Supt., Montour R. R.,
Coraopolis, Pa.

Executive Committee
L. H. TURNER, Supt. Motive Power, P. & L. E. R. R., Pittsburgh, Pa.
D. J. REDDING, Asst. Supt. Motive Power, P. & L. E. R. R., McKees Rocks, Pa.
F. R. McFEATTERS, Supt. Union R. R., East Pittsburgh, Pa.
A. G. MITCHELL, Supt. Monon. Div., Penna. R. R., S. S., Pittsburgh, Pa.
F. M. McNULTY, Supt. Motive Power, Monon. Conn. R. R., Pittsburgh, Pa.

Finance Committee
STEPHEN C. MASON, Secretary, The McConway & Torley Co., Pittsburgh, Pa.
E. K. CONNEELY, Asst. to Vice President, P. & L. E. R. R., Pittsburgh, Pa.
CHAS. A. LINDSTROM, Asst. to President, Pressed Steel Car Co., Pittsburgh, Pa.
L. C. BIHLER, Traffic Manager, Carnegie Steel Co., Pittsburgh, Pa.
WALTER V. TURNER, Asst. Manager,
Westinghouse Air Brake Co., Wilmerding, Pa.

Membership Committee
FRANK J. LANAHAN, President, Fort Pitt Malleable Iron Co., Pittsburgh, Pa.
A. STUCKI, Engineer, Pittsburgh, Pa.
C. O. DAMBACH, Supt., W. P. T. R. R., Pittsburgh, Pa.
HARRY HOWE, Inspector of Castings, Pressed Steel Car Co., McKees Rocks, Pa.
R. L. KLEINE, Chief Car Inspector, P. R. R., Altoona, Pa.
B. E. D STAFFORD, General Manager, Flannery Bolt Company, Pittsburgh, Pa.
SAMUEL LYNN, Master Car Builder, P. & L. E. R. R., McKees Rocks, Pa.

Entertainment Committee
D. H. AMSBARY, District Manager, Dearborn Chemical Co., Pittsburgh, Pa.
HARRY MURDOCH, President, H. Murdoch & Co., Pittsburgh, Pa.
E. C. SATTLEY, General Manager, Page Woven Wire Fence Co., Monessen, Pa.

Past President

J. H. McCONNELL	October, 1901, to October, 1903.
L. H. TURNER	November, 1903, to October, 1905.
F. H. STARK	November, 1905, to October, 1907.
* H. W. WATTS	November, 1907, to April, 1908.
D. J. REDDING	November, 1908, to October, 1910.
F. R. McFEATTERS	November, 1910, to October, 1912.
A. G. MITCHELL	November, 1912, to October, 1914.
F. M. McNULTY	November, 1914, to October, 1916.

* Deceased.

Meetings held fourth Friday of each month, except June, July and August.

PROCEEDINGS OF MEETING, DECEMBER 18, 1916.

The monthly meeting of The Railway Club of Pittsburgh was called to order by President J. G. Code at 8 o'clock P. M. at the Commercial Club auditorium.

The following gentlemen registered:

MEMBERS.

Adams, Lewis
Anderson, A. E.
Anderson, J. B.
Antes, E. L.
Armstrong, J. L.
Babcock, F. H.
Barth, J. W.
Battinhouse, J. M.
Berghane, A. L.
Bosley, N. D.
Buffington, W. P.
Calvin, A. W.
Cassiday, C. R.
Chester, C. J.
Code, J. G.
Conner, W. P.
Cotton, A. C.
Courtney, D. C.
Cunningham, W. P.
Donovan, P. H.
Drayer, U. S.
Elverson, H. W.
Emery, E.
Ewald, Wm.
Evans, F. J.
Fields, A. C.
Flinner, John
Forrest, C. H.
Freshwater, F. H.
Frey, A. R.
Gellinger, Chas. W.
Gies, George E.
Gilg, H. F.
Gowdy, H. K.
Greeve, Robert E.
Grewe, H. F.
Gross, C. H.
Grow, C. D.
Hansen, G. L.
Hettler, R. C.
Hindman, S. M.
Hoffman, C. T.
Holbrook, W. H.
Howe, Harry
Huchel, H. G.
Hudson, W. L.
Kelly, H. B.
Kelley, H. D.
Kinch, L. E.
Knapp, A. D.
Kummer, J. H.
Lanahan, Frank J.
Lang, W. C.
Lansberry, W. B.
Lawley, R. N.
Lidstone, F. J.
Lindstrom, Chas. A.
Llewelyn, W. R.
Lobez, P. L.
Long, R. M.
Lynch, P. W.
Maier, J. L.
Marshall, W. T.
Mask, H. K.
Mathus, D. L.
Milligan, E.
Mitchell, A. G.
McAbee, W. S.
McCollum, G. C.
McDonnell, F. V.
McFarland, H. L.
McFeatters, F. R.
McNulty, F. M.
O'Connor, M.
Orbin, George N.
Pennepacker, N. W.

Pratt, I. D.
Redding, D. J.
Richardson, C. A.
Saints. Chas. A.
Schaeffer, F.
Schiller, John
Schomberg, W. T.
Sleeman, W. C.
Smith, C. P.
Smith, D. W.
Spielmann, J. A.
Stafford, B. E. D.
Stillings, William
Stucki, A.
Stumpf, F. L.
Suckfield, G. A.
Thomas, F. B.
Thomas, J. H.
Turner, Walter V.
Walther, G. C.
Weiss, C.
Williams, H. S.
Williamson, J. A.
Wright, J. B.

VISITORS.

Bankat, J. G.
Bendall, D. P.
Breit, C. A.
Browarsky, E. L.
Burd, C. E.
Cady, Wm. M.
Cadman, M. M.
Cadman, R. N.
Clapper, H. A.
Critchlow, G. N.
Darby, A. O.
Doolin, C. H.
Downs, I. G.
Dummett, T. C.
Ekes, E.
Flinn, R. H.
Haymond, C. W.
Jones, H. A.
Jones, O. B.
Katzin, William
Lee. R. E.
Lowery, Joseph
Maliphant, C. W.
Mead, E. B.
Miller, G. H.
McLaughlin, R. W.
Rogers, W. R.
Shimer, J. H.
Sneck, H.
Stenson, G. A.
Wolf, M.
Woltz, M. H.

The roll call was dispensed with, the attendance being recorded on the registry cards.

The reading of the minutes was dispensed with and the minutes as submitted for printing approved.

The Secretary read the following list of applications for membership:

Broome, S. P., Representative A. M. Byers Co., 235 Water Street, Pittsburhg, Pa. Recommended by H. H. Maxfield.

Canby, J. L., Representative Chicago Pneumatic Tool Co., 10 Wood Street, Pittsburgh, Pa. Recommended by F. M. McNulty.

Critchlow, J. N., Superintendent of Inspection, Crucible Steel Co., Midland, Pa. Recommended by M. O'Connor.

DeVore. Harry T., Assistant General Foreman Car Shops, P. & L. E. R. R., 1234 Resaca Place, N. S., Pittsburgh, Pa. Recommended by Saml. Lynn.

Dodds, Ethan I., Representative Flannery Bolt Company, Vanadium Building, Pittsburgh, Pa. Recommended by B. E. D. Stafford.

Dummett, T. C., Clerk, Union R. R., 6 Luray Street, N. S., Pittsburgh, Pa. Recommended by J. L. Maier.

Flannery, J. Rogers, Vice-President, Flannery Bolt Company, Vanadium Building, Pittsburgh, Pa. Recommended by B. E. D. Stafford.

Flinn, R. H., Assistant Master Mechanic, Pennsylvania Lines West, N. S., Pittsburgh, Pa. Recommended by F. V. McDonnell.

Foster, John S., Engineer, W. L. E. & W. P. T. Railway, Massillon, Ohio. Recommended by C. O. Dambach.

Gorsuch, C. B., Superintendent B. & O. R. R., B. & O. R. R. Depot, Pittsburgh, Pa. Recommended by J. A. Spielmann.

Grayble, R. A., Clerk, P. & L. E. R. R., 218 Sagamore Street, Pittsburgh, Pa. Recommended by Saml. Lynn.

Haymond, C. W., Foreman Car Repairs, P. & L. E. R. R., 217 South Garland Avenue, Youngstown, O. Recommended by Saml. Lynn.

Heinemann, W. G. H., Inspector, P. R. R., 3952 Howley Ave., Pittsburgh, Pa. Recommended by F. S. Robbins.

Hyland, Chas., Boiler Expert, Flannery Bolt Company, 926 Francis Street, Jackson, Mich. Recommended by B. E. D. Stafford.

Keller, W. L., Traveling Car Inspector, P. & L. E. R. R., McKees Rocks, Pa. Recommended by Saml. Lynn.

Kohl, H. J., Foreman Passenger Cars, P. & L. E. R. R., 1106 Tweed Street, Pittsburgh, Pa. Recommended by Saml. Lynn.

Kuhnert, C. C., Photographer, Westinghouse Air Brake Co., East McKeesport, Pa. Recommended by F. B. Thomas.

McComn, G. E., Clerk, M. C. B. Office, P. & L. E. R. R., McKees Rocks, Pa. Recommended by Saml. Lynn.

O'Malley, W. G., Manager, Crucible Steel Co., Midland, Pa. Recommended by M. O'Connor.

O'Neil, H., Locomotive Engineer, B. & O. R. R., 4817 Lytle Street, Hazlewood, Pa. Recommended by D. C. Courtney.

Ralph, J. E., Foreman, P. & L. E. R. R., 1219 Fourth Avenue, Coraopolis, Pa. Recommended by Saml. Lynn.

Ramsdell, F. E., Train Master P. & L. E. R. R., McKees Rocks, Pa. Recommended by A. D. Brown.

Rogers, W. R., Chief Joint Inspector, P. & L. E. and Erie R. R., Youngstown, Ohio. Recommended by Saml. Lynn.

Smithson, A. D., Clerk, Union Star Line, Fulton Building, Pittsburgh, Pa. Recommended by M. O'Connor.

Thomas, E. K., Master Mechanic, Aetna Chemical Co., 21 Park Street, Crafton, Pa. Recommended by Chas. Newlin.

Weaverling, J. H., Chief Dispatcher, B. & O. R. R., Room 310, B. & O. Depot, Pittsburgh, Pa. Recommended by J. A. Spielmann.

Wright, C. W., Secretary, Steel Car Forge Company, 1127 Frick Building, Pittsburgh, Pa. Recommended by Frank J. Lanahan.

PRESIDENT CODE: Upon approval by the Executive Committee and the payment of one year's dues these gentlemen will become members without further action.

The subject for discussion this evening is "Freak Inventions" or "Freak Patents." We know from a source very close to the speaker of the evening that down at the Patent Office in Washington they have two classifications of patents, Turner's and Miscellaneous. I am not so sure from which classification he gets his material for the address this evening, but that no doubt will develop a little later.

It would be idle for me to undertake to introduce to the Railway Club of Pittsburgh the speaker of this evening, so I will simply give Mr. Walter V. Turner the floor.

MR. TURNER'S TALK ON FREAK PATENTS MADE BEFORE THE RAILWAY CLUB OF PITTSBURGH

DECEMBER 18, 1916.

Mr. Walter V. Turner, Assistant Manager of the Westinghouse Air Brade Company, threw on the screen some lantern slides which were taken from letters patent issued by the United States Patent Office at Washington. These slides illustrated devices of a freakish nature on which patents had to be granted by the office because of the *new and novel* features involved.

Mr. Turner had extracts to read from the various letters patent, because, as he explained, words quite failed him in expressing properly the wondrous advantages the freak patents offer, and the inventor himself could do the device justice in the way of description!

All members and guests of the Club who attended will readily appreciate the foregoing. Those who were absent cannot be further enlightened—it was their misfortune not to have seen the slides and heard the remarks.

PRESIDENT: I feel quite certain that our friend Turner is in both those classifications at Washington. Is there any discussion?

DISCUSSION.

MR. D. J. REDDING: There is not much use of anyone trying to criticize or comment on Mr. Turner's inventions. The last ones shown, while he did not say so, are the inventions of Mr. Turner, and I think perhaps he is the only man in the room or in the country, who could tell you all about them. But the fact is that Mr. Turner is a wizard. One of the most remarkable things I know of his having done was in connection with a test on the Lake Shore a few years ago, where they found that the best brake they had would not stop trains fast enough, at least not as fast as they wanted them to be stopped. They held up their test either seven or eight days, I forget which, and Mr. Turner came back to Pittsburgh and finished in the machine shop a complete new brake that had never seen the light of day before, and took it back and put it on the train, and cut down the length of the stop by a very remarkable percentage. There were no drawings made of the device until after it was all done. It was worked out entirely in the shop by the gentleman who has just entertained us.

PROFESSOR L. F. ENDSLEY: I for one am going to have a great deal more patience with all perpetual motion inventors since Mr. Turner said he had started out to make a perpetual motion machine. About every third or fourth month a man comes into my office with a perpetual motion machine, so I am going to have more consideration for him as he may yet find something great. Those of us who have studied in detail some of the things Mr. Turner has gotten out appreciate beyond a doubt their excellence. Nevertheless every man who got up a patent shown on the screen tonight was going to make millions out of it. I feel sorry for a good many of them, but I do not feel very sorry for Mr. Turner.

And that reminds me of a little story I heard the other day about a colored fellow and a Jew that got to Heaven about the same time. The colored fellow was just a little ahead and St. Peter asked him, "What are you doing here, 'Rastus?" "I done wants in." "All right," said Peter, "sit down and I will look up your record." After a while he came back with a smile on his face and said, "Come in. You are one of the best men I have had come up here in a long time. You can have anything you want." Rastus came in, but the thing hit him rather sudden and he did not know just what to ask for. But finally he said he would like to have a seven-room cottage and a million dollars. St. Peter counted him out the money and pointed down the street and told him to pick out the house he liked best. The Jew was looking through the bars meanwhile and St. Peter said to him, "Who are you and what do you want?" He said, "I am Abey Cohen." "Take a seat while I look up your record." After a while St. Peter came back with a frown. He did not say anything at first, but finally he said, "Abey, you are just about good enough to get in here but hardly that. You have always been pretty sharp in your dealings with your fellow men, but you have done some things that are good and I will let you come in. But I don't know that we can do very much for you, but if you have any small wish we will try to take care of you." And Abey replied. "I would be perfectly satisfied with $60 worth of cheap jewelry and that colored fellow's address."

Now I do not think any of us would throw that at Mr. Turner, because he gets it without that. But I do want to say that this little explanation which he gave tonight of the operation of trains in stopping was a wonderful thing and those of you who have not studied it will get a good deal of pleasure out of doing so.

MR. FRANK J. LANAHAN: I cannot see where Mr. Turner need apologize for any lack of education. As a matter of fact, he has cultivated the marvelous tact of adapting himself absolutely to his surroundings. It is the constant effort on the dramatic stage for the actor to put himself entirely in the atmosphere of the time in which his character represents, and unless he is completely absorbed in the delineation, failure meets his efforts. To such a degree of perfection has Mr. Turner mastered all these details, that he even uses jokes belonging to the periods in which his various patents were made. I noted on the screen a patent issued in 1860 and I am almost certain that the story Mr. Turner told of the Irish man saving the Jew was much related about the time of that particular patent—possibly it was a generation or two earlier, but our very earnest-minded English friend, forgetful of the cob-webs and the musty flavor, related the Hibernian-Isrealite salvation episode as joyfully as though it had not done constant service long before any of the present members of the Railway Club were born.

Seriously, though, I am especially pleased with Mr. Turner's joking remarks on the frivolous side of patents, but mentioning at the same time that these various patents may all be for a good purpose. If he had confined himself to the humorous features entirely, there are some here that might have lost sight of the fact of his being such a marvelous inventor, with a record of patents issued, practically second to none, and I fear have passed over the important fact that even these inventions that have been shown may have worth. It strikes me that a great many people who have ideas and are afraid to develop them because of ridicule, might be induced to work them out to the great advantage of society at large, and incidentally to their own financial advancement. You see the results that are obtained by Mr. Turner in his Westinghouse Air Brake, which his modesty prevents him from claiming as fully and strongly as he might. When you think of men like Prof. Langley, who, as our good old friend, Uncle John Brashear has told us, died of a broken heart on account of the criticism that cut so deep for the failure in connection with his airship experiments, we can see why encouragement should be given. There are any number of other individuals whose lives ended in poverty simply because they lacked possibly the commercial instinct, failed to have the proper appreciation, but whose inventions later on became wonderful propositions for the furtherment of the human race. Knowledge of this sort should stimulate all people who have some inventive ideas running through their system, particularly the brainy chaps that are found in the membership of the Railway Club of Pittsburgh, and that is a feature of Mr. Turner's talk that should be emphasized.

PRESIDENT: I can not remember as far back as 1860, but I think I heard that story soon after the war. I see Mr. A. E. Anderson in the audience. May we hear from him?

MR. A. E. ANDERSON: This has been very interesting. I had in mind a question to ask Mr. Turner as to what he would consider the development from the persons who would spend their time and money in studying all these various devices which appear to us to be exceedingly freakish. We must admit that these men who spent their time and went to the expense of paying for patents, thereby aiding in making the Patent Office self-sustaining, certainly were sincere in everything they did. And we know that a great many patents that have been developed later by others have been founded on ideas in some of these early patents and developed into really valuable things. And my notion was to ask Mr. Turner to explain whether he thought all that effort wasted in a good many lines or whether certain good had come from it.

MR. WALTER V. TURNER: That is a question rather hard to answer. It all depends on how far the people went after they failed to make a success or after the thing was demonstrated to be a failure. I sometimes say that concrete cases better illustrate the point than a dozen references to the abstract. I think if I could explain to you some of the freakish, foolish things that I did in those first years out on the plains and in the

Rocky Mountains you would think I was in the same class, and probably I was. But I always had in mind the thought that I was dealing with acceleration and deceleration, that is, with force, with motive power of some kind. Out there, for instance, I invented such things as mowing machines, wind mills and devices for cutting horses loose from a runaway. You know the common practice with a wind mill is to put on the brake or quarter it with the wind when it exceeds a certain velocity. I improved that arrangement with a pantograph motion which, as the wind increased, lengthened the pump stroke so that it was all the way from one inch in a light wind to two feet in a high wind, and only when a regular blizzard took place did the thing automatically center itself with the wind. And in some sections that proved to be quite a valuable device. I never took out a patent on it because I did not have the patent notion at that time. My mind never ran to patents until just before I came to the Westinghouse Air Brake Co. These things served a very useful purpose for me in that they gave me a certain knowledge of the forces at work in building up mechanical devices, and my perpetual motion machine that I tried to build really did more to me than any twenty years I could possibly have spent otherwise, because it taught me that there is such a thing as reaction, that the greater force always overcomes the weaker, and these became so firmly imbedded in my mind that I never make any attempt in these days to build a device before I know whether it will work or not. I think it is true of the most complicated thing I showed here tonight, that I actually never saw it until it was completed. It was from these foolish devices on which I originally worked that I got whatever insight into mechanical appliances I now possess. It all depends upon whether a man is discouraged with his failures or whether he is inspired by them. I always claim that you never can learn anything from your successes—it is only from the failures that you can learn. I am rather disappointed when a thing is a success. It passes out of my mind unless something unexpected develops. For example, I was called to New York recently to help build a railroad for certain interests—one to carry ore from a hill to the docks thirteen miles away on a four per cent grade—quite a problem when you consider the labor they have to call on down there. The proposal was made that they dispense with the human equation entirely. This involved getting rid of all the men except a tower man and taking the cars up the thirteen-mile grade empty and back down again loaded, spacing them 1,000 feet apart. If anything should go wrong these cars come to a standstill; if everything goes right they keep on going. That looked like quite a problem at the start, but it really turned out to be a very simple one. What seemed a very simple part of the problem turned out to be a very difficult one. A motor-driven air compressor has to have a crank case and in that crank case stands a certain amount of oil. That oil must be kept out of the motor compartment. Now each of these cars, with 90 tons load in them, automatically clamps itself to a truck and the truck turns over. In other words, this is an automatic car dump. It is impossible that the oil will not run to the top of the compressor and yet, it is understood, the oil must be kept out of the bearings and thus out of the motor at any cost. If you want a problem see how you are are going to keep the oil out of those bearings and the other parts of the case when the car is up side down. That will eventually turn out to be a very trifling problem, but at the same time, like many other things, it is hard today.

I remember at Toledo, when we built the brake that was spoken of by Mr. Redding, several motive power men were walking along the track. Before they put the brake on I figured out that that brake should stop that train with two or three million pounds of kinetic energy in it in 1,106 feet. When the run was made the train was stopped in 1,153 feet. Remember, this was the second run ever made with that brake. You can see how entirely everything in that device obeyed the laws of nature from the fact that we could take an entirely new brake and reduce the breaking distance from 1,780 to 1,153, figuring the stop out to within a few feet before ever the brake was tried out. That gives some idea of how these propositions figure out. When that train stopped for the first time I was reading a book. I kept on reading and when the Vice President of our Company, Mr. Miller, came into the train (and he is ordinarily not very emotional) and he told me the distance of the stop. I don't know that I was a bit surprised. I expected the stop to be that short. I did not see how it could help it. As we were walking down on the track this second stop was coming and all the rest of them stepped off the track and I kept walking on the ties.

Mr. Gibbs made the remark, "You better get off or you will get hit." I said, "That train will not come within three hundred feet of where I am when it stops," and it did not.

Some people have a foolish courage, but when a man takes hold of a device that is a failure the first thing he should do is to find out why it failed, and if you find that out you certainly have brains enough to make it go. So when you ask what the result will be it is all up to the man as to whether he will become discouraged and quit or whether he will fight it out. So firmly am I convinced of this that if I could get half a dozen young fellows to devote their lives to some purpose I know they could not fail. I know it is just a case of whether or not they are willing to pay the price.

MR. REDDING: If no one else wishes to ask any questions, I think the least we can do to show our appreciation of what he has shown us here tonight and our appreciation of the man and of the real inventions he has brought out, is to give him a vote of thanks. I move, therefore, a rising vote of thanks, unless Mr. Turner has something else to add.

MR. TURNER: I intended to call attention in my last remarks to a gentleman here who has really done one of the most wonderful things in regard to the controlling of trains I know of and I wanted to use that as an illustration. When I was out West I heard a lot about the Armstrong brake. Of course out on those mountains they had use for it. It is a very hard thing to build a hand brake that will control some of those heavy vehicles. The force has to be multiplied a great deal. When I came to Pittsburgh I learned that this Armstrong brake was the Lindstrom brake, and from the day that brake was put on passenger cars it has so well fulfilled its functions that it has always continued to be used and it is used today, with no improvement on it whatever. It is as perfect a mechanism for the purpose as can possibly be made. I understand that when Mr. Lindstrom devised that brake he also had his difficulties. I often come across this device built in Pittsburgh, as it is on practically every passenger vehicle in the country because of its convenience, its reliability and its multiplying power. It was called the Armstrong brake out there. So whatever measure of success you give to me in helping transportation you must always remember that you have another member in your association who is also mixed up with the art of controlling trains.

MR. CHARLES A. LINDSTROM: Mr. Turner's compliments are quite a surprise to me, but nevertheless appreciated. I am not the first man to put a handbrake lever on a car, but I think I have a right to claim the credit for having put the first successful brake lever on a car. I had a great deal of difficulty to start with because I had to do with a good many people, both college men and others, who really did not understand what power is or how it is developed, but that was all overcome at last and what is known as the "Lindstrom Brake Lever," as Mr. Turner says, has been quite successful. I only wish I had owned it, but I had to sell it when it was quite new and other people received most of the financial benefit; however, if it has been of some service in railroad operation, I am very glad and feel that I have been amply rewarded. I thank you, Mr. Turner.

MR. LANAHAN: I wish to second Mr. Redding's motion. I think we have had a very pleasant and instructive evening and I think the subsequent remarks thoroughly cover the point I wished to make.

The motion for a vote of thanks was carried unanimously. There being no further business,

ON MOTION, Adjourned.

J. B. Anderson
Secretary.

RAILWAY CLUB NOTES.

The following subjects were presented and discussed by the several Railway Clubs during the month of December, 1916, as noted below:

New York Railroad Club, Harry D. Vought, Secretary,
95 Liberty Street, New York, N. Y.

SUBJECT—Annual meeting.

New England Railroad Club, Wm. E. Cade, Jr., Secretary,
683 Atlantic Avenue, Boston, Mass.

SUBJECT—"Railway Signaling" by C. E. Denny.

Canadian Railway Club, Jas. Powell, Secretary,
P. O. Box 7, St. Lambert, near Montreal, Can.

SUBJECT—"Heavy Electric Traction" by J. A. Shaw.

Richmond Railway Club, F. O. Robinson, Sec'y, Richmond, Va.

SUBJECT—"Projected Light in Railway Service" by L. C. Porter.

St. Louis Railway Club, B. W. Frauenthal, Secretary,
Union Station, St. Louis, Mo.

SUBJECT—"How Railroad Dividends May Be Increased" by Dr. A. Ross Hill.

Southern & South Western Ry. Club, A. J. Merrill, Secretary,
Box 1205, Atlanta, Ga.

SUBJECT—Unknown.

Central Railway Club Buffalo, N. Y., Harry D. Vought,
Secretary, 95 Liberty Street, New York, N. Y.

SUBJECT—No meeting.

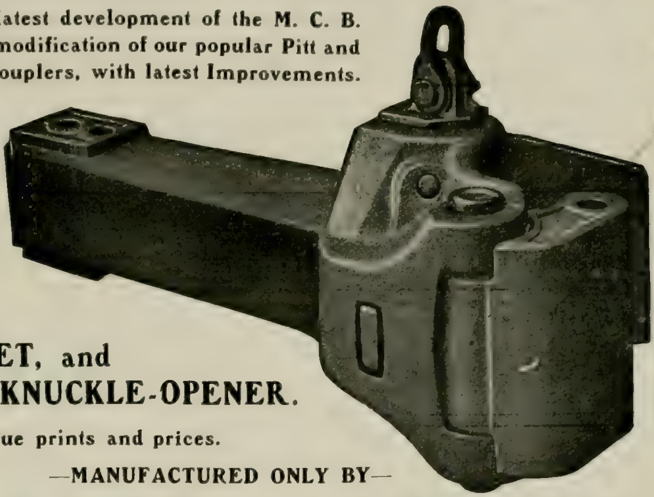
The Railway Club of Pittsburgh, J. B. Anderson, Secretary,
207 Penna. Station, Pittsburgh, Pa.

SUBJECTS—"Freak Patents" by Walter V. Turner.

Copies of the above papers can be had upon application to the Secretary at the address given for a nominal price.

THE PENN COUPLER

Our latest development of the M. C. B. Coupler, a modification of our popular Pitt and Janney X Couplers, with latest Improvements.



LOCK-TO-THE-LOCK,

LOCK-SET, and KNUCKLE-OPENER.

Send for blue prints and prices.

—MANUFACTURED ONLY BY—

THE McCONWAY & TORLEY CO.,
PITTSBURGH, PA.

This Space For Sale

PINTSCH MANTLE LIGHT

The system that has made good wherever it has been applied . . . .

SAFETY ELECTRIC LIGHT

Type "F" regulation ensures constant lamp voltage and long lamp life .

The Safety Car Heating & Lighting Co.

Chicago, Philadelphia, Washington, Boston,
St. Louis, San Francisco, Montreal

2 Rector St., New York

KING METALLIC PACKINGS

for Locomotive Piston Rods, Valve Stems & Air Pumps

SECURITY WRIST PIN
LEACH SANDERS
GOLLMAR BELL RINGER
INDESTRUCTIBLE OIL CUP
BRAIDED SWAB, ETC.

The U. S. Metallic Packing Co.
PHILADELPHIA

FIREBOX FACTS

1. Big locomotives have long wheel bases.
2. Long wheel bases must be covered by long boilers.
3. Long boilers mean excessive flue lengths.
4. Excessive flue lengths represent investment in heating surfaces of low evaporative values.
5. Shorter flues mean longer fire boxes.
6. Longer fire boxes (with combustion chambers) of the radial stay type are dangerous and introduce added stay bolt troubles.
7. The Jacobs-Shupert sectional fire box (and combustion chamber when required) supplies the means for designing locomotive boilers of correct economic proportions and at the same time for reducing maintenance problems to a minimum.

"YOURS FOR BETTER BOILERS"

Jacobs-Shupert U. S. Firebox Co.

30 Church St., New York. Works: Coatesville, Pa.

RAILWAY STEEL-SPRING COMPANY,

Springs,
Steel Tired Wheels,
Locomotive and Car Wheel Tires.

GENERAL OFFICE, 30 CHURCH STREET, NEW YORK
BRANCH OFFICES:—CHICAGO, ST. LOUIS, ST. PAUL, WASHINGTON, D. C.

This Space For Sale

STANDARD STEEL CAR COMPANY

OFFICES { General Offices: Frick Bldg., PITTSBURGH, PA.
NEW YORK: 170 Broadway
CHICAGO: Fisher Building

WORKS { BUTLER, PA.
NEW CASTLE, PA.
HAMMOND, IND.

STEEL AND COMPOSITE

FREIGHT CARS

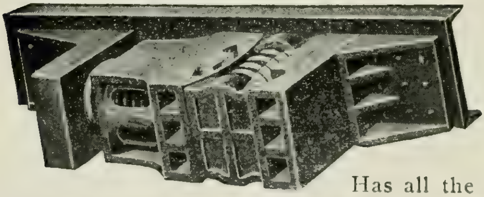
For all Classes of Service, from our Standard Designs,
or according to Specifications of Purchasers.

Steel Car Underframes

TRUCKS, BOLSTERS, BRAKE BEAMS, ETC.

Capacity 50,000 Cars per Annum

INQUIRIES SOLICITED

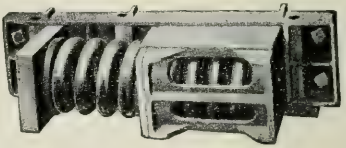


USE BUTLER
DRAFT GEARS
FRICTION RIGGING
PIPER PATENTS
200,000 lbs. Capacity.
Has all the points of a Perfect Gear.

TANDEM SPRING ATTACHMENTS
6¼x8 or 8x8 DRAFT SPRINGS
PERFECT SPRING PROTECTION

Butler Drawbar Attachment Co.

Send for Catalog CLEVELAND, OHIO



SCHAEFER
DROP-FORGED
FOUNDATION BRAKE GEAR DETAILS,
COMBINE
MORE STRENGTH WITH LESS WEIGHT

Schaefer Equipment Company

Oliver Building Pittsburgh, Pa.

STANDARD STEEL PLATFORMS
ARE IN USE BY 281 COMPANIES
SESSIONS—STANDARD FRICTION DRAFT GEARS
ARE IN USE BY 205 COMPANIES
—BOTH MADE BY—
THE STANDARD COUPLER CO.
CHICAGO: People's Gas Building NEW YORK: 30 Church St.

J-M RAILROAD SUPPLIES

Roofings
Packings
Gaskets
Pipe Coverings
Hair Felt
Smoke Jacks
Asbestos Wood
Waterproofing
Cork

Fibre Conduit
Locomotive Lagging
Flexible Armored Squirt, Tank, Car Heating, Air Brake and Air Signal Hose
Air Brake Expander Ring
Steel Car Insulation
Underground Conduit
Asbestos Cements

Brake Lining and Blocks
Electrical Supplies
Mastic Flooring
Speedometers
Fire Extinguishers
Manual Slack Take Up for Air Brakes
Vitribestos Stack Lining
Refrigerator Car Insulation

Write for Catalogs
H. W. JOHNS-MANVILLE COMPANY
New York and Every Large City

Union Steel Casting Company,
PITTSBURGH, PA.
Steel Cast Locomotive Frames, Driving Wheel Centers, and Miscellaneous Locomotive Castings.
Vanadium Steel Castings a Specialty

Standard Heat & Ventilation Co. Inc.
Heating Apparatus for Railway Cars and Locomotives
Car Ventilators, Storage Battery Charging. Plugs and Car Receptacles.
165 Broadway New York

Freight and Passenger

CARS

Of Every Description

Pressed Steel Specialties

Tank Cars Mine Cars

Pressed Steel Car Company

New York Pittsburgh Chicago St. Paul

FOR

GREATER EFFICIENCY

USE

DAVIS **SOLID-TRUSS** BRAKE BEAMS

FOR

Freight and Passenger Equipment.

ALSO

Pressed Steel Journal Box Lids.

DAVIS BRAKE BEAM CO.,

JOHNSTOWN, PA.

FRANK J. LANAHAN, Pres. CHAS. J. GRAHAM, Vice-Pres. H. L. REPLOGLE, Gen'l. Sales Rep.

STUCKI
Side Bearings

SAVE WHEELS, RAILS, POWER
AVOID DERAILMENTS

A. Stucki Co.
Oliver Building
PITTSBURGH,
PA.

This Space For Sale

This Space For Sale

SUYDAM'S Protective PAINTS
For Freight Cars and Structural Steel Work
—MANUFACTURED BY—
M. B. SUYDAM COMPANY,
OFFICE AND WORKS, 61ST AND BUTLER STS.,
BELL 'PHONE, 343 FISK. PITTSBURGH, PA.

This Space For Sale.

Library
of Pittsburgh

FOR SALE

BRADY BRASS CO.
MANUFACTURERS OF
CYPRUS BRONZE FOR LOCOMOTIVE and CAR BEARING USE
ENGINE CASTINGS BABBITT METALS
JOURNAL BEARINGS MOTOR BEARINGS
General Office and Works, 170-182 Fourteenth St. and 169-175 Fifteenth St., Jersey City, N. J.
DANIEL M. BRADY, President

SCHMIDT SUPERHEATER LOCOMOTIVES
Make firing easier
Haul longer trains
Save coal and water
Maintain faster schedules
LOCOMOTIVE SUPERHEATER COMPANY
30 Church St., New York.
Peoples Gas Bldg., Chicago.

OFFICIAL PROCEEDINGS
RAILWAY CLUB OF PITTSBURGH
$1.00 Per Year
20¢ Per Copy
Vol. XVI. JANUARY 26, 1917 No. 3

THE MAN PROBLEM

By Mr. D. C. Buell, Director, The Railway Educational Bureau.

BULLDOZER AND HEADING MACHINE WORK
STEEL CAR FORGE COMPANY
"FORGING SPECIALISTS"
PITTSBURGH NEW YORK CHICAGO

FOR SALE

Electrical Uses
ARISTOS
"COPPERWELD"
Mechanical Uses
A COPPER CLAD STEEL WIRE
Product of the COPPER CLAD STEEL CO., Pittsburgh, Pa.
Drawn and Sold Exclusively by
PAGE WOVEN WIRE FENCE CO., - - Monessen, Pa.

FOR SALE

TORCHES

Gem Torches Save You Money

Exhaustive tests by largest railway systems have proven that Gem Brazed Seam Torches do save money. Let us prove it. Send for free sample and information.

Gem Manufacturing Company
PITTSBURGH, PA.

Graham Nut Company
PITTSBURGH, PA.

MANUFACTURERS OF

Hot Pressed Nuts, Cold Punched C. & T. Nuts
Bolts, Lag Screws, Washers, Etc.

This Space For Sale

A Happy New Year Boys!

May the roadbed of 1917 prove firm and smooth and may you get the right of way through to Prosperity.

And don't forget to include Johnson Bearings in your good resolutions.

They'll help to keep trouble away.

P. S.—I've got a surprise coming — look out for it next month.

JIM

OF THE

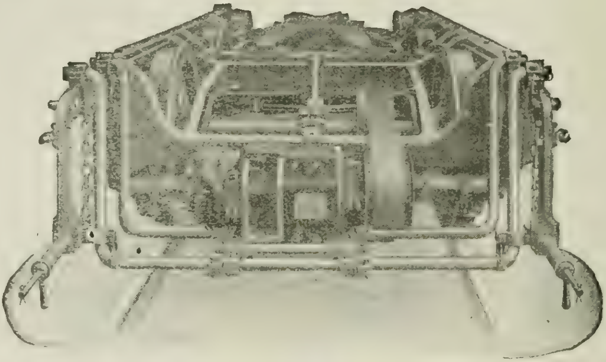
BUSHINGS

JOHNSON BRONZE COMPANY
formerly the American Car & Ship Hdw. Mfg. Co.
NEW CASTLE, PA.

LET US QUOTE ON
YOUR REQUIREMENTS

THE GOULD "SIMPLEX" SYSTEM OF

ELECTRIC CAR LIGHTING



GOULD COUPLER CO.

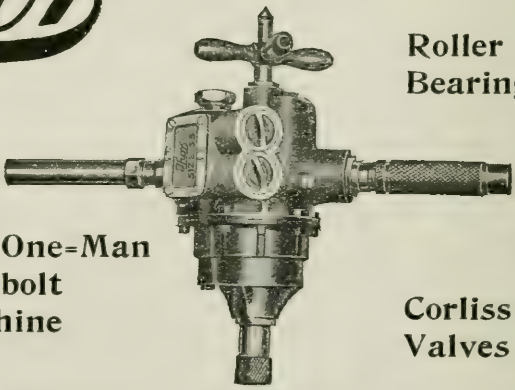
NEW YORK

Thor

Roller-Bearing Compound
Piston Air Drills

Roller
Bearings

No. 32
L



The One=Man
Staybolt
Machine

Corliss
Valves

FURNISHED ON TRIAL FREE. WRITE NEAREST BRANCH

INDEPENDENT PNEUMATIC TOOL COMPANY

Chicago : New York : Pittsburgh : Detroit : San Francisco : Birmingham : Montreal, Que.

MANNING, MAXWELL & MOORE,

ROBT. A. BOLE, MANAGER, PITTSBURGH BRANCH

PARK BUILDING

LONG DISTANCE TELEPHONE CALL. GRANT 67

Railway and Machinists' Tools and Supplies, Electric Traveling Cranes, Compressors, Pneumatic Hoists, Riveters and complete Machine Shop and Foundry Equipment

NATIONAL CAR WHEEL COMPANY

MANUFACTURERS OF

"STAR SPECIAL"

Reg. U. S. Patt. Off.

CHILLED CAST IRON CAR WHEELS

WORKS:
Rochester, N. Y. Pittsburgh, Pa.
Sayre, Pa. Cleveland, O.
New York City, N. Y.

General Offices:
PITTSBURGH, PA.
New York Office:
556 WEST 34th STREET
Phila. Office:
506 FRANKLIN BANK BLDG.

BRAKE SHOES

AMERICAN BRAKE SHOE
AND FOUNDRY COMPANY

MAHWAH, N. J.

NEW YORK
30 CHURCH ST.

CHICAGO
332 SO. MICHIGAN AVE.

This Space For Sale

NATHAN MANUFACTURING CO.
101 PARK AVE. NEW YORK

1612 Old Colony Building, Chicago.

Monitor, Simplex and Nathan Injectors for Locomotives

AND

Sight-Feed Lubricators.

All Specially arranged for High-Pressure Engines.

STEAM FIRE EXTINGUISHERS FOR SWITCHING AND YARD ENGINES.

Boiler Washers, Boiler Testers, Rod and Guide Oil Cups, Etc.

—— SOLE AGENCY FOR THE ——

Coale Muffler & Safety Valve Co., Inc.

ESTABLISHED 1884

SIPE'S JAPAN OIL

"STRENGTHENS, DRIES, AND WATERPROOFS;
Add Sipe's Japan Oil And Improve the Paint".

IN DAILY USE BY ALL THE LEADING RAILROADS IN THE UNITED STATES

—— MANUFACTURED ONLY BY ——

CHICAGO ILL. **JAMES B. SIPE & CO.** PITTSBURGH, PA.

LOCOMOTIVE BLOW-OFF

DOES SATISFACTORY WORK ON MANY ROADS.

Can be worked from cab or foot board while running.

A catalog or call by Representative for the asking.

Homestead Valve Mfg. Co.,
Works: Homestead, Pittsburgh, Pa.

=: FARLOW DRAFT ATTACHMENT :=

For { **TWIN M. C. B. DRAFT SPRINGS**
OR
FRICTION DRAFT GEARS

THE T. H. SYMINGTON CO.

New York Chicago Baltimore Rochester

BALL'S
VARNISH REMOVER

OXOLIN
REGISTERED
THE IDEAL PAINT OIL

B. C.
SPIRITS

Ball Chemical Co.

CHICAGO Office,
63 W. Van Buren Street.

Fulton Bldg., PITTSBURGH, PA.

Logical Construction
is a feature of
BOYER
Pneumatic Hammers

No. 80X Boyer Riveting Hammer. Capacity 1⅜ inches.
Length overall only 21⅜ inches.

Boyer Hammers are made in three parts, cylinder, handle and valve—a construction which facilitates examination, cleaning and repairs, and extends the life of the tool indefinitely.

Write for Hammer Bulletin 124.

CHICAGO PNEUMATIC TOOL CO.

PITTSBURGH: 10 and 12 Wood St

1052 Fisher Bldg.
CHICAGO

Branches Everywhere

52 Vanderbilt Ave.
NEW YORK

H. H. HEWITT, PRESIDENT. W. H. CROFT, VICE-PRESIDENT

MAGNUS METAL

MEETS ALL HIGH-GRADE REQUIREMENTS.

IT IS THE STANDARD METAL

FOR LOCOMOTIVE WEARING PARTS,

JOURNAL BEARINGS FOR { FAST PASSENGER CAR SERVICE,
HEAVY FREIGHT CAR SERVICE.

MAGNUS COMPANY

111 BROADWAY, NEW YORK.

DURABILITY COUNTS

DIXON'S SILICA GRAPHITE PAINT

is the "LONGEST SERVICE" paint. Recommended and largely used as standard by railroad economists, and engineers, throughout the entire world, for bridges, steel cars, tanks, signal apparatus etc. Made in FIRST QUALITY only. Write us for long service records and booklet No. 152-B.

Made in JERSEY CITY, N. J., by the

JOSEPH DIXON CRUCIBLE COMPANY

D X N TRADE MARK ESTABLISHED 1827 D X N TRADE MARK

RAILWAY SPECIALTIES

The National Malleable Castings Co.

CLEVELAND, CHICAGO, INDIANAPOLIS, TOLEDO,
SHARON, PA. MELROSE PARK, ILL.

MALLEABLE IRON AND STEEL CASTINGS

PEERLESS

MECHANICAL RUBBER GOODS AND PACKINGS HAVE THAT DURABILITY DEMANDED BY RAILROADS.

Peerless Rubber Mfg. Co.

31 WARREN ST. NEW YORK

BOSTON CHICAGO PHILADELPHIA MINNEAPOLIS

The Air Brake Game

today is a complicated one—and is growing more so daily. No longer will one general rule fit all cases—each individual case is a problem in itself, and as such must be met and solved. Our Engineering organization combines the experience of all railroad air brake engineers and, therefore, is specially fitted to take up and solve any and all air brake problems. Their services are free to our customers, who are requested to call them in on all air brake work, whether it be new specifications, modification of old equipment, or just ordinary, plain, every-day troubles.

Westinghouse Air Brake Co.

General Office, Wilmerding, Pa.

New York, City Investing Building; Pittsburgh, Westinghouse Building; Chicago, Railway Exchange Building; St. Louis, Boatmen's Bank Building.

Westinghouse
Electric Arc Welding Outfits

have reduced the repair costs in many railroad shops.
They save their cost in three months time.
Full information on request.—Booklet 3049-A.

Westinghouse
Electric Motors for Railroad Shops

Pressed-Steel Types for either alternating or direct current. Rugged, serviceable, efficient and long lived. Full information on request.

Westinghouse Electric & Manufacturing Co.

Sales Offices In All
Large American Cities

W
WESTINGHOUSE ELECTRIC

EAST PITTSBURGH
PENNSYLVANIA

2-10-2 TYPE LOCOMOTIVES

Total Weight of Engine, 352,500 pounds; Weight on Drivers, 293,000 pounds; Diameter of Drivers, 57 inches; Tube Length, 17 feet; Boiler Pressure, 190 pounds; Cylinders, 28x32 inches; Maximum Tractive Power, 71,200 pounds.

Because of its long rigid wheel base many railroad officials have had to eliminate the 2-10-2 type when considering more powerful locomotives.

Lateral motion driving axles and boxes were applied to the New York, Ontario & Western, 2-10-2 type locomotives to reduce the rigid wheel base to that which is in common use on Consolidation and Mikado type locomotives, and at the same time secure the advantages of the ten-coupled wheel arrangement with the resulting increased capacity of the locomotives.

Write us for further information regarding the lateral motion device.

AMERICAN LOCOMOTIVE COMPANY
30 CHURCH STREET, NEW YORK

YOU GET THE MAXIMUM OF DURABILITY FROM OUR

SEMAPHORE ENAMEL

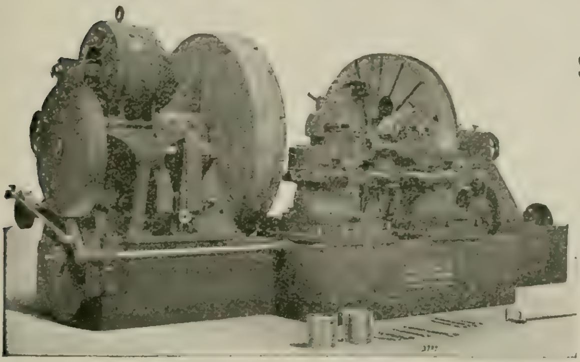
All colors—Write to us for samples.

Yarnall Paint Company
MANUFACTURERS - - - PHILADELPHIA

This Space For Sale

Railroad Repair Shop Equipment

Combining all modern features for rapid, convenient operation.



MACHINE TOOLS

STEAM HAMMERS

ELECTRIC TRAVELING CRANES

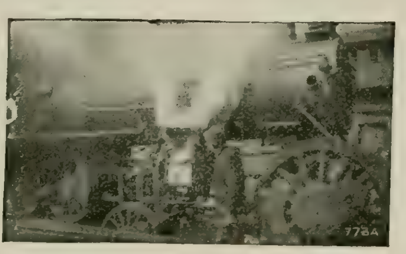
P. & W. SMALL TOOLS AND M. C. B. GAUGES

Niles New Model Driving Wheel Lathe Has broken all wheel shop records.

WRITE FOR CATALOGUE

NILES-BEMENT-POND CO.

111 Broadway, New York. **Pittsburgh Office, Frick Building.**



Making Thermit Weld Without Removing Frame

Welding Frames In Place

With Thermit

Saves Time and Money

The mechanical officials of 420 Railroad Shops are saving thousands of dollars every year using "Thermit" for welding their broken engine frames in place, and are returning their engines to service in from 10 to 24 hours.

If you are not using **Thermit** in **YOUR** shop you are not taking advantage of the great saving that **Thermit** can effect.

Our new pamphlet 2167 will describe and illustrate what **Thermit** is doing for others. Shall we send it?

Goldschmidt Thermit Company

WILLIAM C. CUNTZ, General Manager

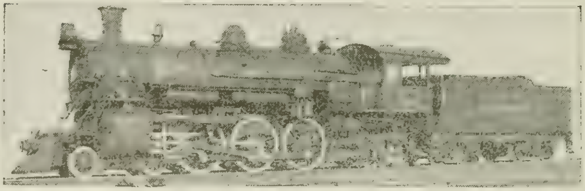
120 BROADWAY, NEW YORK

103 Richmond St. W., Toronto, Ont. 329-333 Folsom St., San Francisco

7300 S. Chicago Ave., Chicago

THE BALDWIN LOCOMOTIVE WORKS

PHILADELPHIA, PA., U. S. A.



LOCOMOTIVES

OF EVERY DESCRIPTION

Electric Motor and Trailer Trucks

SECURITY

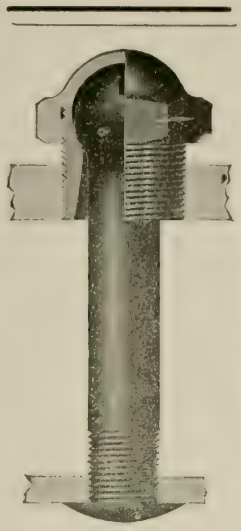
SECTIONAL ARCH

Makes staybolt inspection easy.
Saves flue troubles.
Reduces engine failures.
Easy to apply and remove.
Small brick of light weight.
Cools off quickly.
Many other good features.

AMERICAN ARCH COMPANY

30 Church Street,
New York

McCormick Building,
Chicago



The Best Staybolt
FOR LOCOMOTIVE FIREBOXES

Railroads Are Now Using
The Tate Flexible Staybolt
At the Rate of
1,250,000 A YEAR

Our Services Are Always
At Your Command

FLANNERY BOLT CO.
Vanadium Building
PITTSBURGH, PENNA.
B. E. D. Stafford, General Manager

J. Rogers Flannery & Co.
SELLING AGENTS
Vanadium Building
PITTSBURGH, PENNA.

The Draper Manufacturing Co.
Manufacturers of
PNEUMATIC FLUE WELDERS

For Scarfing, Welding and Swedging Boiler Flues up to 4" Diameter.

Pneumatic Tube Welding Machines for Welding and Swedging Superheater Tubes.

Flue Reclaiming Equipment used in connection with Pneumatic Flue Welders.

HUNT-SPILLER IRON
HAS THE
STRENGTH AND WEARING QUALITIES
THAT ARE ABSOLUTELY NECESSARY IN
LOCOMOTIVE CASTINGS
PRICES MODERATE RESULTS GREAT
Manufactured Only By
Hunt-Spiller Manfg. Corporation
W. B. LEACH, President and Gen'l Manager.
J. G. PLATT,
Sales Manager.
OFFICE AND WORKS:
383 DORCHESTER AVENUE
SO. BOSTON, MASS.

GALENA-SIGNAL OIL COMPANY

FRANKLIN, PENNA.

Sole manufacturers of celebrated

GALENA LUBRICANTS

PERFECTION VALVE and SIGNAL OILS

and

Galena Railway Safety Oil

Manufactured for

STEAM AND ELECTRIC RAILWAY USES EXCLUSIVELY

Guaranteed Cost **Expert Service Free**

CHARLES MILLER,
Chairman.

S. A. MEGEATH,
President.

FORT PITT MALLEABLE IRON CO.

PITTSBURGH, PENNA.

MANUFACTURING SPECIALISTS
OF MALLEABLE CASTINGS
FOR THE RAILROAD AND
CAR COMPANY TRADE.

FEATURES

Superior Quality

Expeditious Delivery

Consistent Price

INDEX—ADVERTISERS.

NAME Page

American Arch Co. x

American Brake Shoe & Foundry Co. iii

American Locomotive Company. . . viii

Baldwin Locomotive Works. x

Ball Chemical Co. v

Brady Brass Co. . . . . Front Cover

Butler Drawbar Attachment Co. . . xviii

Chicago Pneumatic Tool Co. v

Davis Brake Beam Co. xxi

Dixon, Jos., Crucible Co. vi

Flannery Bolt Co. xi

Fort Pitt Malleable Iron Co. xii

Galena Signal Oil Co. xii

General Electric Co. xvii

Gem Manufacturing Co. . . . Front Cover

Goldschmidt Thermit Co. ix

Gould Coupler Co. ii

Graham Nut Company. . . . Front Cover

Homestead Valve Mfg. Co. iv

Hunt-Spiller Mfg. Co. xi

Independent Pneumatic Tool Co. . . . ii

Jacobs-Shupert U. S. Fire Box Co. . xvi

Johns-Manville Co. xix

Johnson Bronze Co. i

Locomotive Superheater Company. . . . . Front Cover

Magnus Company. vi

Manning, Maxwell & Moore. iii

NAME Page

McConway & Torley Company. xv

Nathan Manufacturing Co. iv

National Car Wheel Co. iii

National Malleable Castings Co. vi

Niles-Bement Pond Co. ix

Page Woven Wire Fence Co. Front Cover

Peerless Rubber Mfg. Co. vi

Pressed Steel Car Co. xx

Railway Steel Spring Co. xvi

Safety Car Heating & Lighting Co. xvi

Schaefer Equipment Co. xviii

Sipe, James B., & Co. iv

Standard Coupler Co. xix

Standard Heat & Ventilation Company, Inc. xix

Standard Steel Car Co. xviii

Steel Car Forge Co. . . . . . . Front Cover

Stucki Co., A. xxi

Suydam, M. B. Co. . . . . Back Cover

The T. H. Symington Co. v

The Draper Manf'g Co. xi

The U. S. Metallic Packing Co. xvi

Union Spring & Mfg. Co. xiv

Union Steel Casting Co. xix

Westinghouse Air Brake Co. vii

Westinghouse Electric & Mfg. Co. . vii

Yarnall Paint Co. viii

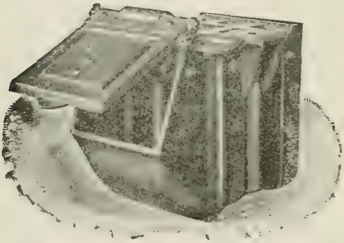
Union Spring & Manufacturing Co.

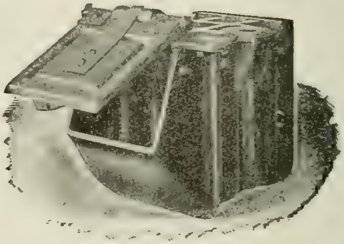
SPRINGS

Kensington All Steel Journal Boxes

PRESSED STEEL JOURNAL BOX LIDS

STEEL CASTINGS





Lightest and Strongest M. C. B. Journal Boxes Made.

WORKS:

NEW KENSINGTON, PA.

GENERAL OFFICE:

First National Bank Bldg., Pittsburgh, Pa.

NEW YORK - 50 Church Street.
CHICAGO - Fisher Building.
ST. LOUIS - Missouri Trust Building.
RICHMOND, VA., AMERICAN NATIONAL BANK BUILDING.
LOUISVILLE, KY., 42 Todd Building.

OFFICIAL PROCEEDINGS
OF
The Railway Club of Pittsburgh

Organized October 18, 1901.

Published monthly, except June, July and August, by The Railway Club of Pittsburgh, J. B. Anderson, Secretary. General Offices, Penna. R. R., Pittsburgh, Pa.

Entered as Second Class Matter February 6, 1915, at the Postoffice at Pittsburgh, under the Act of March 3, 1879.

Vol. XVI.
No. 3.
Pittsburgh, Pa., Jan. 26, 1917.
$1.00 Per Year
20c Per Copy

OFFICERS FOR 1916—1917

President
J. G. CODE,
General Manager, W. P. T. R. R.,
Pittsburgh, Pa.

First Vice President
H.H. MAXFIELD,
Supt. Motive Power, P. R. R.,
Pittsburgh, Pa.

Second Vice President
D. M. HOWE,
Paint Expert,
Pittsburgh, Pa.

Secretary
J. B. ANDERSON,
Chief Clerk, Supt. M. P., P. R. R.,
Pittsburgh, Pa.

Treasurer
F. H. STARK,
Genl. Supt., Montour R. R.,
Coraopolis, Pa.

Executive Committee
L. H. TURNER, Supt. Motive Power, P. & L. E. R. R., Pittsburgh, Pa.
D. J. REDDING, Asst. Supt. Motive Power, P. & L. E. R. R., McKees Rocks, Pa.
F. R. McFEATTERS, Supt. Union R. R., East Pittsburgh, Pa.
A. G. MITCHELL, Supt. Monon. Div., Penna. R. R., S. S., Pittsburgh, Pa.
F. M. McNULTY, Supt. Motive Power, Monon. Conn. R. R., Pittsburgh, Pa.

Finance Committee
STEPHEN C. MASON, Secretary, The McConway & Torley Co., Pittsburgh, Pa.
E. K. CONNEELY, Asst. to Vice President, P. & L. E. R. R., Pittsburgh, Pa.
CHAS. A. LINDSTROM, Asst. to President, Pressed Steel Car Co., Pittsburgh, Pa.
L. C. BIHLER, Traffic Manager, Carnegie Steel Co., Pittsburgh, Pa.
WALTER V. TURNER, Asst. Manager,
Westinghouse Air Brake Co., Wilmerding, Pa.

Membership Committee
FRANK J. LANAHAN, President, Fort Pitt Malleable Iron Co., Pittsburgh, Pa.
A. STUCKI, Engineer, Pittsburgh, Pa.
C. O. DAMBACH, Supt., W. P. T. R. R., Pittsburgh, Pa.
HARRY HOWE, Inspector of Castings, Pressed Steel Car Co., McKees Rocks, Pa.
R. L. KLEINE, Chief Car Inspector, P. R. R., Altoona, Pa.
B. E. D. STAFFORD, General Manager, Flannery Bolt Company, Pittsburgh,Pa.
SAMUEL LYNN, Master Car Builder, P. & L. E. R. R., McKees Rocks, Pa.

Entertainment Committee
D. H. AMSBARY, District Manager, Dearborn Chemical Co., Pittsburgh, Pa.
HARRY MURDOCH, President, H. Murdoch & Co., Pittsburgh, Pa.
E. C. SATTLEY, General Manager, Page Woven Wire Fence Co., Monessen, Pa.

Past President

J. H. McCONNELL	October, 1901, to October, 1903.
L. H. TURNER	November, 1903, to October, 1905.
F. H. STARK	November, 1905, to October, 1907.
* H. W. WATTS	November, 1907, to April, 1908.
D. J. REDDING	November, 1908, to October, 1910.
F. R. McFEATTERS	November, 1910, to October, 1912.
A. G. MITCHELL	November, 1912, to October, 1914.
F. M. McNULTY	November, 1914, to October, 1916.

* Deceased.

Meetings held fourth Friday of each month, except June, July and August.

PROCEEDINGS OF MEETING, JANUARY 26, 1917.

The monthly meeting was called to order by President J. G. Code at 8 o'clock, P. M. at the auditorium of the Commercial Club.

The following gentlemen registered:

MEMBERS.

Amsbary, D. H.
Anderson, A. E.
Anderson, G. S.
Anderson, J. B.
Arnold, J. G.
Babcock, F. H.
Bean, Wm. H.
Bell, R. P.
Berg, K.
Bosley, N. D.
Bowden, T. C.
Brennan, E. J.
Broome, S. P.
Brunner, F. J.
Buckbee, W. A.
Buffington, W. P.
Burket, C. W.
Caine, C. D.
Chester, C. J.
Chittenden, A. D.
Clark, C. C.
Cline, W. A.
Code, J. G.
Copeland, T. T.
Courtney, D. C.
Cunningham, W. P.
Dambach, C. O.
DeVore, H. T.
Draper, Thomas
Emery, E.
Endsley, L. E.
Ferren, R. O.
Fleming, H. O.
Flinn, R. H.
Forrest, C. H.
Foster, J. S.
Fulton, A. M.
Funk, S. R.
Gray, C. B.
Grewe, H. F.
Gilg, H. F.
Gross, C. H.
Grow, C. D.
Hansen, G. S.
Haynes, J. E.
Heinamann, W. G. H.
Hink, G. L.
Hoffman, C. T.
Howe, D. M.
Huchel, E. W.
Huchel, H. G.
Huchel, Wm. J.
Hudson, W. L.
James, Robt. E.
Johnson, W. M.
Kennedy, W. B.
Keptner, J. B.
Kinch, L. E.
Kindle, W. F.
Kinter, D. H.
Kinney, M. A.
Koch, H. J.
Kummer, Joseph H.
Lanahan, J. S.
Lansberry, W. B.
Laurent, George F.
Lehr, H. W.
Lent, J. F.
Long, R. M.
Loughridge, H. W.
Lowe, W. D.
Marshall, W. T.
Maxfield, H. H.
Merscher, John
Millar, C. W.
Miller, G. H.

Milliken, I. H.
Morris, H. W.
Mowry, E. H.
Mitchell, A. G.
Mitchell, John
McConn, G. E.
McDonnell, F. V.
McFeatters, F. R.
McKinstry, C. H.
McNulty, F. M.
Neff, John P.
Neel, T. M.
Newburn, T. W.
O'Connor, M.
Parke, F. H.
Painter, Joseph
Pearson, A.
Pennepacker, N. W.
Pennington, F. W.
Ralph, J. E.
Rea, C. S.
Richardson, C. A.
Ridley, R. C.
Robbins, F. S.
Rohn, W. B.
Schaff, A. J.
Schaich, W. L.
Scheck, H. G.
Schiller, J. S.
Schwegler, H.
Searles, E. J.
Sewell, H. B.
Speilmann, J. A.
Sloan, N. H.
Stark, F. H.
Stevenson, Wm.
Stillings, Wm.
Stucki, A.
Tanner, C. J.
Tennant, S. D.
Tucker, J. L.
Turner, L. H.
Vowinkel, F. F.
Walther, G. C.
Williamson, J. A.

VISITORS.

Bamhart, B. F.
Bronder, N., Jr.
Buell, D. C.
Center, R. D.
Corse, G. H., Jr.
Cox, Thos. M.
Deem, E. E.
DeZafra, Carlos
Farrel, H. L.
Gardner, H.
Gibson, P. E.
Haver, W. M.
Henicuer, L. E.
Kaiser, Joseph
Koll, J. F.
LeVier, F. L.
Linfester, L. C.
Luscombe, J. T.
Lynn, Wm., Jr.
Martin, R. A.
Maylock, E. A.
Morris, H.
McLaughlin, George C.
McIntosh, R. L.
Petterson, L.
Robinson, W. L.
Rodgers, Robert J.
Stanton, Thomas
Stenson, G. A.
Taylor, A. M.
Taylor, H. G.
Taylor, James
Thompson, H. H.
Trainer, M. N.
Weissert, W.
Zimmerman, Saml.

By unanimous consent the roll call was dispensed with and the minutes of the last meeting were approved as submitted for publication.

The Secretary read the following list of applications for membership:

Boate, H. S., Piece-work Inspector Car Department, P. & L. E. R. R., 323 Russelwood Avenue, McKees Rocks, Pa. Recommended by Samuel Lynn.

Bochert, Carl G., Piece-work Inspector Car Department, P. & L. E. R. R., care Master Car Builder, McKees Rocks, Pa. Recommended by Samuel Lynn.

Brown, W. C., Representative Monongahela Lumber Company, 715 House Building, Pittsburgh, Pa. Recommended by D. H. Amsbary.

Buck, Leo, Locomotive Fireman, Union R. R., 209 Fifth Ave., Homestead, Pa. Recommended by T. T. Copeland.

Cocayne, W. H., Engineer, Carnegie Steel Co., 114 West Eighth Avenue, Homestead, Pa. Recommended by T. T. Copeland.

Cox, Thomas M., Inspector, Carnegie Steel Co., 166 Steuben Ave., Crafton, Pa. Recommneded by T. T. Copeland.

Evans, J. K., Foreman Car Repairs, P. & L. E. R. R., Dickerson Run, Pa. Recommended by Samuel Lynn.

Farrell, H. L., City Passenger Agent, B. R. & P. Railway, 531 Smithfield Street, Pittsburgh, Pa. Recommended by C. O. Dambach.

Fay, Frank L., President, Greenville Steel Car Co., Greenville, Pa. Recommended by Frank J. Lanahan.

Fields, D. S., Foreman, Car Department, P. & L. E. R. R., 2911 Fourth Avenue, Beaver Falls, Pa. Recommended by Samuel Lynn.

Gaither, Alonzo, Locomotive Engineer, Carnegie Steel Co., Hays, Pa. Recommended by T. T. Copeland.

Gwaltney, R. H., Representative, The T. H. Symington Co., 30 Church Street, New York, N. Y. Recommended by J. B. Anderson.

Hickman, Charles P., Clerk, Car Department, P. & L. E. R. R., 217 South Garland Avenue, Youngstown, O. Recommended by Samuel Lynn.

Heinauer, L. E., Gang Foreman Car Department, P. & L. E. R. R., 52 Frazier Avenue, McKees Rocks, Pa. Recommended by Samuel Lynn.

James, J. H., Chief Clerk to General Manager, P. & L. E. R. R., Pittsburgh, Pa. Recommended by A. D. Brown.

Jones, L. B., Master Mechanic, Pennsylvania R. R., Verona, Pa. Recommended by F. S. Robbins.

Hanna, Wm. T., Locomotive Engineer, U. R. R., 836 Lilac St., Pittsburgh, Pa. Recommended by T. T. Copeland.

Haver, W. M., Assistant Superintendent, B. & O. R. R., B. & O. Depot, Pittsburgh, Pa. Recommended by C. O. Dambach.

Kennedy, J. E., Engineer, Carnegie Steel Co., 1214 Rebecca St., North Braddock, Pa. Recommended by T. T. Copeland.

Lynn, William, Jr., Gang Foreman Car Department, P. & L. E. R. R., Box 161 R. D. 3, Coraopolis, Pa. Recommended by Samuel Lynn.

Madden, Cyril A., Salesman, E. F. Houghton & Co., 14 Butler Street, Millvale, Pa. Recommended by C. T. Hoffman.

Merscher, John, Foreman Car Repairs, P. & L. E. R. R., 348 Woodward Avenue, McKees Rocks, Pa. Recommended by Samuel Lynn.

Mertz, Jacob J., Gang Foreman Car Department, P. & L. E. R. R., 879 Railroad Street, McKees Rocks, Pa. Recommended by Samuel Lynn.

McKee, Frederick C., Treasurer, Winfield R. R., Second National Bank Building, Pittsburgh, Pa. Recommended by C. S. Rea.

McLaughlin, George G., Foreman Shipping Department, Carnegie Steel Co., 346 Fifth Avenue, Homestead, Pa. Recommended by T. T. Copeland.

Price, Michael J., Engineer, Homestead Steel Co., 701 18th Ave., Munhall, Pa. Recommended by T. T. Copeland.

Rodgers, Robert J., Clerk, Pennsylvania R. R., 1203 Boyle St., N. S., Pittsburgh, Pa. Recommended by W. D. Lowe.

Sage, Ralph V., Representative Cambria Steel Co., Widener Building, Philadelphia, Pa. Recommended by Frank J. Lanahan.

Schofield, J. S., Representative Atlantic Refining Co., 424 Sixth Avenue, Pittsburgh, Pa. Recommended by T. T. Copeland.

Shorthill, R. R., Engineer, Carnegie Steel Co., 223 West Ninth Ave., Homestead, Pa. Recommended by T. T. Copeland.

Smith, Joseph V., Manager Shovel Department, Hubbard & Co., 62nd and Butler Street, Pittsburgh, Pa. Recommended by R. L. Mason.

Stanton, Thomas, Gang Foreman Car Department, P. & L. E. R. R., 431 Island Avenue, McKees Rocks, Pa. Recommended by Samuel Lynn.

Stevenson, Robert, Foreman Car Repairs, P. & L. E. R. R., Newell, Pa. Recommended by Samuel Lynn.

Sullivan, M. J., Gang Foreman Car Department, P. & L. E. R. R., 43 Highland Avenue, McKees Rocks, Pa. Recommended by Samuel Lynn.

Taylor, James, Special Apprentice, Westinghouse A. B. Co., 425 Westinghouse Avenue, Wilmerding, Pa. Recommended by C. H. McKinstry.

Teckemeyer, Fred., Gang Foreman Car Department, P. & L. E. R. R., 153 Fairview Avenue, Pittsburgh, Pa. Recommended by Samuel Lynn.

Tennant, S. D., Gang Foreman Car Department, P. & L. E. R. R., 2334 Maple Avenue, N. S., Pittsburgh, Pa. Recommended by Samuel Lynn.

Thompson, H. H., Chief Clerk to Superintendent Motive Power, P. & L. E. R. R., 400 Wayne Avenue, McKees Rocks, Pa. Recommended by Samuel Lynn.

Weston, A. H., Sales Engineer, The T. H. Symington Co., 30 Church Street, New York, N. Y. Recommended by J. B. Anderson.

Wipperman, F. B., Traveling Engineer, Ohio Injector Co., 1437 Monadnock Block, Chicago, Ill. Recommended by T. T. Copeland.

Zimmerman, Saml., Gang Foreman Car Department, P. & L. E. R. R., 554 Russellwood Avenue, McKees Rocks, Pa. Recommended by Samuel Lynn.

PRESIDENT CODE: Upon approval by the Executive Committee and the payment of one year's dues these gentlemen will become members without further action.

The Secretary announced the death of Mr. U. G. Detweiler, whereupon the President directed that an appropriate memorial minute appear in the next issue of the Official proceedings.

PRESIDENT CODE: We have for discussion this evening an address to be presented on a subject which is of the greatest importance to every man in the railroad service and which is becoming of greater importance every day. The late Mr. Harriman has often been extensively praised, and on the other hand extensively criticized, for his operations in the railroad world. But whatever may be said of him, his work was constructive. I remember working a matter of 25 or 26 years ago on the Union Pacific Railroad in the days prior to its receivership, and the conditions there were in every way just about as rotten as you could imagine. Every one knows today what Harriman made of the Union Pacific. It has been practically rebuilt from end to end and supplied with all kinds of up-to-date facilities. One thing that this man did was to see into the future in many things that were not given consideration by the ordinary railway executive, and he saw that the problem of selecting, training and fitting men for promotion is one which is almost wholly neglected on railroads and he provided and had organized a department to undertake that work in connection with his lines of railroad, that has grown into an educational bureau still in operation, and it will be our pleasure and privilege tonight to listen to the Director of that Bureau, Mr. D. C. Buell, whom I take pleasure in introducing to the members and guests of The Railway Club of Pittsburgh.

MR. D. C. BUELL: Mr. President and members of the Club: I feel that I am very highly honored to have the privilege of coming to Pittsburgh to address this Club. When I was East the last time—the first time I had been East for a number of years—I inquired about the various railroad clubs and some of my friends said to me: "If you want to go to a real club, go to Pittsburgh. They are the live ones today."

It has been with a good deal of hesitation that I have come here tonight, knowing as I do of the class of meetings that you have and the quality and interest there is in the papers.

I have prepared a paper on "The Man Problem." This is, perhaps, a peculiar time to talk about that, because there is no opportunity for selection of men at present. The problem today is to get sufficient help, irrespective of quality.

The experiences of the past year, however, have brought us to a realization of the necessity of studying this problem to better protect ourselves in the future, and with that thought in mind I shall present my paper.

THE MAN PROBLEM.

By Mr. D. C. Buell.

Director, The Railway Educational Bureau.

Never in the history of American railroading has the man problem been of as great importance and as difficult of solution as at the present time. This is more particularly true in the East than in the West, on account of the great demand for men in the Eastern industrial centers, and the fact that market conditions have been such that industrial concerns many times have been able to take contracts which would allow them to pay wages far in excess of the established scale.

The result has been that, in spite of their endeavor to hold their men, the railroads have lost thousands of employes, and those who have remained, in many cases, are dissatisfied.

Only a few years ago railroad work was a preferred job. A large majority of the men hired were so-called "local talent"; that is, boys or young men living along the line of the road. Railroad employes who had sons eagerly sought opportunities to get them into the service. Every station agent, in the smaller towns, had one or two boys helping him for the sake of the experience and the opportunity offered to learn the business; track forces were recruited almost exclusively from the young men of the smaller towns and farming communities along the line; and as a result the rank and file of railroad employes were loyal, ambitious, and efficient.

Today, railroad managers are hard-pressed to get men of any description for many classes of service, and even where sufficient employes can be obtained to fiill the ranks numerically, it is, unfortunately, true that in many cases such employes are neither permanent nor loyal, and that, as a consequence, they have no particular ambition to progress in railroad work, with the result that their efficiency is considerably less than it would be under other and better conditions.

We are facing facts—not theories—and in view of these facts, the man problem on the railroad resolves itself into a study which should lead to the solution, and adoption, of ways and means whereby young men of proper mentality, physique, and ambition, can be attracted to the railroad service, held and trained in that service, paid a fair wage in accordance with their ability and worth in the positions to which they are assigned, and given proper opportunity to learn the business, so that they can fit themselves to assume greater responsibility.

In addition to this, the successful solution of the problem depends more than anything else on a properly worked-out plan whereby ambitious men, who *have* proved their loyalty and efficiency, and who have fitted themselves for promotion, are systematically and fairly considered for, and promoted to, better positions, in accordance with their worth and without unreasonable delay.

In addition to the man problem which confronts us, another, and almost as important a problem, arises from the fact that the number of women engaged in railroad work is constantly increasing. The successful manner in which women in the European countries are accomplishing work which heretofore has been considered exclusively a man's work, together with the similar experiences in this country where women have been employed in occupations hitherto closed to them, makes it seem only logical that greater thought be given to the possibilities of this side of the question.

There would seem to be five main considerations which would make for permanency in any organization:

1. Good wages.
2. Permanent work.

3. Reasonable working hours.
4. Fair treatment.
5. Opportunity for advancement.

There are also two supplementary conditions of importance:

1. Pleasant surroundings.
2. Comfortable and sanitary working quarters.

The above conditions will apply in a large majority of cases. In the minority of cases, employes may continue in positions where conditions are not entirely satisfactory, due to the fact that family ties, the ownership of a home, or disinclination to move to another town, may over-weigh unsatisfactory conditions of employment. Again, in every organization there is a certain percentage of employes who have not the mental courage to strike out and make a change. Then, again, there are always a courageous few who rise above difficulties and make good in spite of all conditions. Such employes endure improper conditions, firm in their belief that they will be promoted or transferred to better places within a reasonable time.

It is also true that any one of the conditions that have been stated as essential for the permanency of an organization may have sufficient weight to hold an employe even though other conditions are by no means ideal. For example: With some men, the opportunity to earn high wages, or a wage higher than the average, will out-weigh every other condition of employment, even to the limit of endangered health or the hazard of personal injury or death. The assurance of permanent work and a fixed routine will interest some whose mental make-up is such as to be disturbed by change of any kind. Reasonable working hours will attract some, while an equal number will be attracted by the opportunity for making extra money by over-time work.

Fair treatment and the opportunity for advancement, coupled with a reasonable wage, seem to be the surest means of holding employes, and of guarding against the breaking up of an organization due to someone coming along and winning away experienced employes by the offer of a few dollars' extra wages in some new position.

The supplementary conditions of pleasant surroundings and comfortable and sanitary quarters appeal more particularly to women than to men, but these supplementary conditions also have their appeal to men, though in a lesser degree.

The problem of maintaining an efficient organization on a railroad, or in any other concern, consists in the intelligent selection, hiring, handling, educating, transferring, and promoting of the units of the organization.

I wish to digress for a moment and speak of the care and thought given to the selection, purchasing, handling, improving, and use of a modern locomotive.

Before locomotives are purchased by a railroad, the experience of Operating, Mechanical, and other officials, is called upon to determine the type and weight of the locomotive to be purchased, special equipment required, etc. The materials of which the locomotive are to be made are covered by elaborate specifications. During the building of the engine, the work is inspected and a careful record kept of such inspection. When the locomotive is delivered to the road by the builders, it is again carefully inspected and equipped for service. It is then broken in by a special man, oftentimes under the direct supervision of a Road Foreman of Engines, until it is in shape to perform its work properly. It is then loaded scientifically; its performance is recorded and studied day by day; special facilities are provided to keep it in proper condition to do its most efficient work; at stated intervals it is taken out of service for repairs; as conditions on the road change, it may be transferred from one division to another, where it can do more effective work; but throughout its life it is watched and cared for in a systematic manner.

How differently men are handled on the average railroad today.

Few roads have any specifications as to the qualifications of applicants other than the examination for physical fitness and tests for hearing and vision, which are required in certain branches of the service. Where physical examinations are required, other than in train service, it is usually on account of insurance or sick benefit features rather than on account of selection for physical fitness for a particular job. Mental specifications based on the requirements of the position are almost entirely lacking, and the man comes to the job uninspected—a more or less unknown and uncertain machine.

With few exceptions, such a man is put to work immediately, without any preliminary testing, breaking in, or adjusting to the new work, and his first week's work is done with but little supervision, and that oftentimes not expert. No scientific study is made of this man from day to day to make certain that he is performing efficiently. Few, if any, adjustments are made, even though he may not be "working right," in order to make him a smooth-running part of the machinery of the road. There is no daily performance sheet kept of his work, nor is he inspected from time to time for defects which could easily be remedied by proper handling. He is expected to pull full tonnage from the start, without a study having been made as to his tonnage capacity. If he fails to pull his tonnage, it is seldom that a study is made to find out if he would work better on some other division or in some other department, and it is but seldom that such a man has the opportunity to be transferred to a place where perhaps he could work effectively.

This analogy might be carried still further, but enough has been said to bring out the point desired—namely: That although the men on a railroad are the finest tools which a railroad has, in many cases they are not selected with care, no one pays very much attention to their condition and maintenance, no accurate record is kept of their performance, and they are assigned to duty and loaded with work on a hit-and-miss basis—a method any casual observer can see to be inefficient and ineffective.

Where can we look for a correction of these difficulties? In the very nature of things, railroad organization is so complex that no one department or branch of the service can create a reform which will be effective throughout the entire organization. Corrective principles cannot be applied from the bottom —they must start at the top and work down throughout every branch of the organization.

The day must soon come when the man problem will be considered of sufficient importance to warrant the systematic attention of the executive heads of our railroads. If results cannot be obtained otherwise, it may be necessary to have a special man on the staff of the executive who is at the head of each road, whose duty it will be to study this man problem, and who will be responsible in a general way for every phase of that problem in all departments of the organization. How else can the desired results be accomplished? In what other way can we re-establish the desire to be a railroad man and to do railroad work, in the hearts and minds of the type of men we need in the employ of the railroads of today?

The starting point in any system of building up a better organization is the creation of a desire in the minds of the kind of people who would become efficient in the organization, to enter its service.

The reputation or standing which a firm or corporation has in a community has its influence on the class of employes that can be recruited for its ranks.

It has been said that corporations do not have souls. The following is quoted from an unknown source: "Their souls are the collective or composite spirit of their management. If it is honest, high-minded, and straight, it means a good soul. If it is dishonest and crooked, then it is a bad soul. The soul of the corporation is determined legally by its board of directors, but essentially and practically by its officers who direct and carry out the policy of the institution. The spirit of the chief is invariably carried down through the ranks of the employes and usually permeates the entire rank and file. On the president and chief managing officer, more than on all others, rests the creation and transmission of the spirit of the corporation."

The quotation just given places the fundamental principles of the whole proposition before one. There must be the honest desire on the part of the management of a road to have its organization intelligent, loyal, and efficient, and there must be the definite policy, understood by the entire organization, that every practical means will be taken to carry out this desire. The attitude of the corporation toward its employes must be such that there is no question in their minds but that the company has their welfare at heart, and will deal fairly with them under all conditions.

The executive heads of a large number of railroad companies in America today have this fixed desire, and preach these principles to their officers, and on many roads, the employes *do* feel that the corporation for which they work, has a soul, is interested in their welfare, and intends to give them a square deal, but this is not sufficient. The very complexity of the organization of a modern railroad, together with the inability of executives to make all their minor officials carry out the letter as well as the spirit of their desires, is the reason why something more must be done.

Look back a few years to the time when the "Safety First" slogan first gained prominence in railroad circles. There was this same desire on the part of the management to prevent accidents and injuries to its employes and that desire was transmitted through the organization, however, little progress was made until a comprehensive plan for working out that desire in a practical manner, was evolved and put into effect.

I wish I were wise enough to conceive a slogan for the man problem that would accomplish what "Safety First" has done in working out the safety problems on our railroads. What we want is "a square deal for everyone." Some such slogan as this might be used. We need "square deal" committees in our offices, in our shops, on our divisions. We want to know of practices and of conditions which breed disloyalty, discontent, and disorganization, so that they can be corrected. How can we accomplish it?

Let us examine the proposition of having a staff officer who would have general charge in an advisory capacity, or otherwise, of the selection, hiring, handling, educating, transferring, and promoting of employes on a railroad.

Such a man would arrange to have a definite knowledge of the needs of every department of the railroad, for new employes. He would make a survey of the requirements of each department, and know definitely the general type of man or woman that would be successful in each of the various openings. He would make a study of the scientific selection of employes. He would be practical enough to differentiate between those simple, fundamental tests which can be applied in a general way to the selection of men and women for various classes of work, and the so-called highly "scientific" methods which have been proven of doubtful value. He would not forget the fact that the thing that differentiates human beings from the animals is the fact that the human being has a consciousness and a will, and that in spite of phrenology, psychology, and the many other so-called sciences that are being exploited, the human being must be con-considered as an individual, and that the desire to do and the will to accomplish, mean more than the shape of a man's head or the crook of his nose.

A common-sense study of the principles underlying the selection of men would, naturally, lead to the issuing of a few simple principles, rules, and tests to be used by those whose duty it is to employ men. A further study of the problem would take the duty of employing men out of the hands of incompetent clerks and place it in the hands of competent officials.

A knowledge of the employment needs throughout the system would make it possible to supply men for vacancies at one place from among men who might be laid off at another place, or to supply such vacancies by transferring men from one position to another, or by promotion.

This man, having worked out and put into effect a practical system of selecting men for vacancies, could then turn his attention to the problem of the handling of men. This in itself is a big problem and one for which there is no formula or infallible rule by which it can be solved; but is it not reasonable to assume that there is on every road some man who has been successful in the handling of men, who could be assigned to the duty of meeting with division officials, shop officials, general office officials, and others, for the purpose of explaining to them some of the basic principles underlying the successful handling of men, discussing with them their problems along this line, and advising them concerning the solution of these problems?

James Logan in an article in "System" for December, quotes a verse of Kipling's, entitled "The Sergeant," which contains in a nutshell the important things that foremen handling men must learn:

> " 'E learns to do his watchin
> Without it showin' plain,
> 'E learns to save a dummy
> And shove him straight again;
> 'E learns to check a ranker
> That's buyin' leave to shirk,
> An' 'e learns to make men like him
> So they'll learn to like their work."

It is true that there are individuals on practically every road in the country, who are doing work of this kind. I know of one General Manager, who, by the sheer force of his personality, has inculcated in the minds of practically every officer under him, the spirit of fairness and the understanding of men that is making for loyalty, fellowship, and broad cooperation throughout his entire Operating Department, but on this same road, in other departments, where this man's influence is not felt, there is dissatisfaction and discontent that amount almost to socialism.

The next step in the solution of the problem is the education of men.

What right have we to expect that men will be efficient if no well-directed effort is made to train them for efficient service?

The importance of this problem has been recognized for years. The Mechanical Department of our railroads has been far more progressive along this line than any other department. The work of Thomas, on the Santa Fe, and Cross, and those who followed him, on the New York Central, represents the modern method of working out the problem of educating shop apprentices. But one can turn back many years in railroad history and recall such a man as old John Tong, of the Minneapolis & St. Louis, who could point with pride to a dozen men who today are prominent railroad officers, and say: "They were my boys. I started training them when they worked for me as apprentices in the shop."

The question, however, that immediately arises is: "Why stop with the apprentice boys? Why not have effective instruction in all departments of the railroad?"

The late Mr. E. H. Harriman, whose work stands as a monument to his genius, insisted that a system of training be devised on the Union Pacific which would provide every ambitious employe with an opportunity to increase his knowledge and efficiency; thus fitting men in the ranks for promotion.

The Educational Bureau, which was organized on the Union Pacific in 1909, placed within the reach of every ambitious employe of that Company, an opportunity to study practical railroad information that would be of benefit to him. The success of this plan and its extension to the Illinois Central and later to the Central of Georgia, led to the establishment of the present Railway Educational Bureau, of Omaha, Neb. This Bureau provides a means whereby any railroad can offer to its employes, without expense to the Company, and for the merely nominal charge of a dollar per month to those men interested, an opportunity to study up-to-date, practical railroad methods in practically every field of railroad work. There are many other sources of information available to railroad men—some good and some questionable; but there is no reason why railroad executives who are not yet ready to inaugurate an educational scheme of their own for their employes, should not make a careful investigation of existing educational methods for railroad men and, by careful comparison and analysis, find some educational scheme worthy of recommending to their ambitious employes. With proper supervision, much good can be accomplished in this manner.

There are so many educational plans that can be worked out on a railroad at little expense that it seems absurd that more attention has not been paid to this important phase of the problem. Several roads have station training schools, where applicants for positions in station work are trained before being sent out on the road. The average cost of training such applicants for positions in station service is less than $10.00 each. The training of firemen, brakemen, carmen, clerks, and countless other classes of employes could be accomplished, under proper supervision and direction, at an expense so low compared to the benefits to be derived as to make the investment one of the best dividend-producers imaginable. Think of the fuel wasted by the new fireman, the damage caused by a new brakeman giving improper signals, the mistakes made by a new clerk, which cause the misrouting or loss of a shipment, and compare the expense caused by these wastes and mistakes, with the nominal expense which would be required to establish a central training school on each large system for such men.

Lack of time prohibits longer discussion of this important subject. Our special man could work out these educational schemes and coordinate them in a practical way for the good of the service.

This special man's next important duty would be to work out plans for the intelligent transfer of men from one department to another, to broaden their experience and fit them for promotion, and to intelligently provide for the promotion of men in departments where it was not necessary or advisable to make transfers prior to promotion.

To make promotions on an intelligent basis presupposes the keeping of a comprehensive record of a man's education, experience, ability, etc. Several roads have adopted a card record system for their employes. One such card, worked out for employes of the Mechanical Department of a large railroad, calls for information as to a man's executive ability, his mechanical ability, his accuracy, principles, confidence, discipline, education, energy, experience, initiative, judgment, memory, morality, neatness, organization, promptness, reliability, resourcefulness, tact, and temper. The very fact that a foreman has to analyze his men and make out such a record for them, requires him to make a close study of this man problem, and gives him a line on men of ability who might, perhaps, not otherwise come to his attention.

With a record of this kind, or any other kind that has any merit, the problem of promoting men would be simplified, and a fair consideration would be given to all those who were at all qualified for promotion. With a centralized record of this kind, where a vacancy could not be filled from the organization of a particular shop, office, or division, a man in some other shop, office, or division of the road, who was qualified for the promotion, could be selected, and thus be given his opportunity to make good much sooner than he otherwise might obtain it.

We have briefly discussed the possibilities of a staff officer whose time was devoted to the planning and supervising of methods for the selection, hiring, handling, educating, transferring, and promotion of employes on a railroad, but such a man's duties could be greatly extended.

The five main considerations which have been mentioned as making for permanency in any organization, together with the supplementary conditions of importance, would all be live issues to such a man.

Consider these five items once more:

1. Good wages,
2. Permanent work,
3. Reasonable working hours,
4. Fair treatment,
5. Opportunity for advancement,

and the supplementary conditions of pleasant surroundings and comfortable and sanitary working quarters.

A comparative wage scale has been one of the things that has caused discontent among railroad men for years. Railroad executives have no patience with officers or employes who say things can't be done. Still they, themselves, have been largely responsible for the feeling that wages cannot be adjusted on a more equitable basis than at present.

Can loyalty be inspired or efficiency obtained in an office where clerks know that the only hope of a raise lies in someone ahead of them being discharged or dying? Is there any incentive for a man to exert extra effort when he knows that an arbitrary rule regarding wages and promotion will prevent him from receiving any material recognition for such efforts? Can it be expected that a foreman will do his best work when he knows that many of the men working under him receive higher wages than he does?

Wages *can* be adjusted on a more equitable basis. Nothing is impossible, and our new staff officer, with the broad understanding he would have of the problem, would be in a position to work out equitable readjustments and bring them to the attention of those who would have the authority to make changes.

Anyone who has any knowledge of railroad conditions knows what an enormous problem the adjustment of wages on a railroad is, but the more important the problem, the more necessary its solution, and certainly something can and should be done.

Railroad managers are more and more recognizing the importance of having permanent work for employes. This is indicated by the efforts being made to maintain section forces at normal strength throughout the entire twelve months, by the doing away with the old practice of shutting down shops for two or three days a month, to take care of changes in appropriations, etc. Continued study should be made of this problem so that as far as is practicable, employes would be assured of steady work throughout the year.

The subject of reasonable working hours is one that is of great importance, and our new staff officer could accomplish wonders along this line.

When one sees clerks coming back to work overtime, without pay, three or four nights a week, week after week, it is an indication that something is wrong. How can such men be inspired with loyalty? How can it be expected that such men will not leave the railroad service the first time any kind of a job is offered that pays approximately the same wage and gives an assurance of reasonable working hours?

There are certain branches of railroad service where overtime work will probably be necessary for years to come, but where such work is necessary, why not pay for it on an equitable basis, and thus attract to the work men glad of the opportunity to make the extra money thus offered?

No matter how good a man may be he cannot do his best work in unpleasant surroundings or uncomfortable or unsanitary working quarters. Cockroaches around an office are unpleasant and unnecessary distractions; nor can it be expected that bright, clean young fellows will join track gangs where the bunk cars are alive with vermin and the food is not decently prepared. It is even reasonable to suppose that a "hunkey" would sleep better and be in better shape for his next day's work if his bed were not infested with vermin.

Statistics prove that there are less accidents in a shop which is kept cleaned up, or in a yard that is clean than in similar places where junk is allowed to accummulate and order does not reign.

Our special man could aid in seeing that the men's surroundings were made pleasant, and that their working quarters were comfortable and sanitary. However, he would be far too sensible to call this "welfare work"—he would know it was good business, and that the work should be carried out on a business-like basis, as a business proposition; so that the man would appreciate the matter instead of being antagonized by its being advertised as "welfare work"—another name for "paternalism."

As the work of our new staff officer progresses, his friendship for the men he learns to understand and love, will suggest to him many schemes that he could use, to bring about a closer fellowship among the members of the various groups of employes, as well as between the groups, themselves. Many forms of athletic sports can be encouraged; a baseball league formed among the employes of the various departments and divisions;

bands, clubs, or societies organized—all of which, if rightly handled, will create the feeling of fellowship and mutual understanding among employes.

There is a group of men at the headquarters of one of the large Eastern railroads who are doing some remarkable work of this kind among the employes of their company. It is welfare work, true enough, but what a difference there is between the way it is done by this group of men, who do it because they are human, because they like "folks," because they want to; and the so-called "welfare work" of the professional, which fails because of its very lack of fellowship and love!

Railroad employes are regular folks, just the same as any other group of people; they are more intelligent than the average, more self-reliant, and they will respond more quickly to fair-dealing, true fellowship, and the desire to serve, than any other class of employes in the country; but for these same reasons, they detect more quickly artificiality, selfish interest, and lack of sincerity, than do other groups of workers.

No mention has been made of the perquisites of railroad employment. This omission up to this time has been intentional. Its discussion is a difficult one. Many men hold different views on the subject. Along this line must be considered pension systems, hospital fund systems, accident and health insurance, vacations, the granting of free transportation, and the number of other methods which have been adopted in an endeavor to aid and protect employes and make their work more attractive to them.

In all of these special features designed for the men's benefit, the method of administration is the most important of consideration. When any system is adopted, it should be on a business basis—not on a paternal basis. The administration of the plan must be just, fair, and the thought behind the plan, honest.

Any scheme of this kind must be worked out as a business proposition, pure and simple. Selfish motives or motives advantageous to the company are soon discovered by the rank and file, with the consequent nullification of the good which might have been accomplished had the scheme been put on a purely business basis, equitable alike to the company and its employes.

It takes patience and courage on the part of a railroad officer, no matter how sincere he may be, to gain the loyalty, fellowship, and cooperation of his men. No employe can realize the employer's problems until he, himself, has been an employer. Many times an employe when promoted to foreman becomes so unreasonable in his attitude toward the group he has just left, as to utterly fail in his ability to handle them as individuals, or collectively.

The officer who has the patience and the courage to gain the loyalty, fellowship, and cooperation of his employes, finds that team-work takes the place of unit effort; that good fellowship drives out discontent; that ambition and love of work will change an inefficient organization into an efficient one. It is well worth the effort!

Just a word about so-called "efficiency methods." Time study that forces a man to work as a machine, planning that leaves nothing to his own initiative, organization that considers employes merely as mechanical units instead of human beings, fails. To gain efficiency, the employe must be considered as a fellowman or a fellowwoman; must be inspired, by fair treatment, with the desire to do his or her share in playing the game, and must be intelligently instructed and directed, so that the energy willingly put into the work will be used effectively. Real efficiency on the part of a workman comes as a result of the love of the work being done, and of thoughtful and intelligent effort to do each task well and without waste of time or effort.

A man to be successful must think. All real progress is based on this one thing, and the efficiency expert who tries to make a machine of a man, to relieve him of the necessity for thinking, is working against a principle of humanity that is not subject to change.

Thus we come to the last and most important of the considerations which make for permanency in an organization—fair treatment and opportunity for advancement. All the other conditions are summed up in these two.

Every man has a right to high ambitions. The higher a man aims and the harder he works to accomplish his purpose, the further up the ladder he will climb, even though he may never reach the desired goal. Men must be granted this right to a realization, in whole or in part, of their ambition. Men who are out of place should be studied until they can be located where their energies are directed along right lines. Men should be encouraged, aided, urged—yes, even forced—to take advantage of their opportunities.

In many cases a man working for a railroad has no idea of the vastness of the proposition and the opportunities that are everywhere around him to broaden out and make something of himself. These opportunities should be made known to men in all departments, and a chance given the deserving to make good.

When our American railroads are so organized that, by fair-dealing and proper attention to the welfare of their employes, they have built up loyal, efficient groups of fellow-workers, then, and not until then, instead of other industries taking employes away from the railroads, the railroads will be in a position to attract the men they want to their ranks and to hold them.

Each such group of contented employes will be loyal to their company, will influence their families and friends to sing its praises, and will gain for it favorable public opinion.

The favorable public opinion of the vast army of American railroad employes, their families, and friends, is what is needed to re-establish in the hearts and minds of the public, confidence in our railroads and our railroad securities.

DISCUSSION.

PRESIDENT: It was never my good fortune to know old Mr. Tong of the Minneapolis and St. Louis, but when it comes to pointing to a lot of his boys who have made good we have in our Club a man on whom neither Mr. Tong nor any one else who has been handling apprentices has anything at all, and I would like to have Mr. Turner speak a few words on the subject.

MR. L. H. TURNER, P. & L. E. R. R.: I have not only heard Mr. Buell read his paper, but have also taken time to read the advance copy. He has presented in a most able manner, a subject more far reaching in its effects, embracing more people and more kinds of people, and one of greater and graver importance to American railroads and manufacturers, than any paper every presented before this Club.

The sentiments expressed by Mr. Buell are in the nature of a prophecy. The time is rapidly approaching when every employer of labor must have a standard of efficiency by which his employes must be measured, in order to successfully compete with other concerns. You cannot find an employer of a large amount of labor in this country today, who turned out as great a tonnage, man for man, during 1916, as he had been able to in previous years, due wholly to the spirit of antagonism that so generally prevails at this time between employer and employe, the employe taking advantage of the scarcity of help to do as much or little as he sees fit, knowing that should he lose one position, he would have no difficulty in securing another at the same or better wages.

Among the most disappointing conditions prevailing, is the fact that it made no difference how much wages advanced, the improvement in the man was imperceptible, and in too many instances, the deplorable tendency to injure rather than promote the interests of the employer was too much in evidence.

The unsatisfactory labor condition that we are now passing through is bound to continue long after every man in this room has passed away. By the time the great war in Europe has been settled, at least 15,000,000 able bodied working men will have been destroyed, not counting the millions that have been crippled or otherwise injured to an extent that will render them comparatively useless during the remainder of their lives.

This country has depended largely upon Europe for its labor supply, but cannot look for much from that quarter for at least two generations—And what is the remedy? Simply the education and building up the efficiency of those we now have and those to be born.

Great care must be exercised to start the improvement at the place most needed, and that is, at the very heads of the railroads and the manufacturing concerns—the men who are in positions of responsibility, directing the great numbers employed. Unquestionably a great amount of the dissatisfaction and unrest that prevails today is due to incompetent and unreasoning supervision. In most cases, the Superintendent or Foreman, or any other title by which he may be known, of today, was the ordinary workman of yesterday. He is invariably selected because of his ability to get out large quantities of work, and not for his knowledge of men, or his ability to mold them into his ways of thinking, and by teaching them how to use their heads, double their output and at the same time double their earning capacity.

The five main considerations mentioned by Mr. Buell tell the story, viz., Good Wages, Permanent Work, Reasonable Working Hours, Fair Treatment and Opportunity for Advancement, Pleasant Surroundings and Comfortable and Sanitary Working Quarters, in connection with such educational work as can be carried on by every railroad company and manufacturer, at a small expense. These conditions cannot fail to bring the results.

Every concern employing large numbers of men should be doing its part by carrying on night schools and during the day too, if necessary, to teach their portion of the 8,000,000 foreigners now in this country to read, write and speak the English language. The man problem as presented by Mr. Buell is already attracting much attention, and the sentiment is growing that if we wish to protect our foreign trade that is now so well established, that immediate steps must be taken to increase the efficiency of our labor supply, and nothing will be so helpful in starting and carrying out this great work as the promulgation and distribution of the ideas offered by Mr. Buell.

PRESIDENT: Having heard something from one of Mr. Tong's competitors we may learn something of advantage from one of his boys, Mr. Woodbridge.

MR. H. C. WOODBRIDGE, B. R. & P. Ry.: This certainly is a golden opportunity, not for criticism, but for constructive approval of the theories and policies so ably presented by Mr. Buell in his charmingly instructive discourse. I feel very deeply on this subject and am embarrassed because of my inability to do justice to the occasion. My mind has been full since reading Mr. Buell's paper but in view of what has been and will be said it would be entirely out of place for me to attempt a comprehensive review. So I will emphasize but one feature and that is the foreman problem. And while doing so I want you to apply that title to every officer in the department which may be in question, for I think there is no more thoroughly demoralizing factor than the incompetent or half way competent officer. With open minded, clear brained big men as foremen the man problem will be half solved.

And in this connection I want to take issue with Mr. Buell's statement that corrective principles can not be applied from the bottom. Do not misunderstand me, I have no patience with the unreasoning fire eater, the disloyal and often incompetent committeeman; but many corrective principles have been and are being applied from the so-called bottom because of years of incompetence or unfitness somewhere in the official staff. And how about Mr. Buell's staff officer; who would have general charge, in an advisory capacity or otherwise, of the selection, hiring, handling, educating, transferring and promoting of employees on a railroad." Imagine this man interfering with the plans of any one of many of the present day officers. I like this scheme of Mr. Buell's, but before it will work the official forces, to a limited extent at least, must be born again. We have meetings of this sort and pat each other on the back and talk about "the men." Let us take a good dose of Dutch Cleanser internally, make the most of the corrective and creative power in our associates, co-operate ourselves and we will not have to worry about the co-operation of others. And when we find defects in the official staff, correct them instead of enforcing "peace at any price" by smearing oil and sugar over the deficiencies until every one is stuck in the gum. But I am not altogether a pessimist and so I want to tell you briefly of a pleasant visit I had recently on one of the large east and west lines in the south. While the blacksmith foreman, Mr. L., was taking me around their wonderfully equipped general repair shop he introduced me to their manufacturing tool room foreman, and when I said that Mr. L. had shown me many interesting things this tool room foreman replied: "If Mr. L. has shown you everything in which he is interested he has shown you nearly everything in this whole plant." A little later I visited with the Superintendent of Motive Power and remarked on the wonderful spirit and interest and co-operation of the shop foreman and asked incidentally who should be credited with a particular device. The Superintendent of Motive Power replied: "I just told 'old man L.' to get busy, and that die was the result. It saved $18,000 the first year." And later, while riding on one of their Mallet locomotives with their Road Foreman of Engines he asked if I had met their General Manager and upon my replying that I had and very pleasantly, he said, "There is only one," which remark was quickly seconded by the engineer, whom I later learned was a Grievance Committeeman. There are some bright spots on the horizon. Let us make more of them.

PRESIDENT: As an educational proposition we are possessed in Pittsburgh of a variety of opportunities for education and can give a great many chances of that kind to our employees if we will take advantage of the chances. I believe Professor Endsley is present and can tell us something about the educational proposition before the University of Pittsburgh.

PROFESSOR L. F. ENDSLEY: I am very glad to say that I have known the speaker for some fifteen or eighteen years and I knew him when he didn't know enough to write that paper. And to prove my point that he did not know as much as he does now, I may tell you that he has always been of an investigative turn of mind and one time when he was doing some of his typical investigation he thought he would see how close to the end of the stroke the cross head came, and he found out very quickly. And Mr. Buell has been going through the railroad game ever since, trying to find out how to get things and men out of tight places, and he has been able to do it several times. And if his paper has done you as much good as it has me, it may help you to get out a tight place some time later on.

But I tell you this, it has been a great pleasure in my life to have been associated with men who are anxious to make a success. There are two kinds of men who go to college. One class go because their fathers send them, and I do not have to say anything about that class, it takes care of itself. But there is another class of men who go to college with the high ambition of trying to fit themselves to do something big in the world. Most of them enter college with that ambition and when they leave they still have it. The proposition of developing young men to fill responsible positions is a very big one. But nine out of ten men who go through college are just as ambitious to be good men as you will find in almost any walk of life and I have had great pleasure in helping these young men to discover problems and then solve problems. One of the great questions of the young man today is "What can I get into to make a success?" They come into my office as Freshmen and ask me if I think it would be a good thing for them to go into this or that.

Now I know nothing about the boy, I don't know what talent he has, I don't know what his ability is, I don't know anything except that he is ambitious to succeed. But I imagine that I would be in as good position to tell him what to do as a foreman would be to tell a man he is hiring what to do. He would have the same brief knowledge of what he looked like and that is about all. So that unless we do give some attention, as this paper suggests, to these men after they get into college or after they get into the work they are carrying on, and watch them and help them and give them every advantage in the world how can we expect them to be of any particular value later on?

PRESIDENT: I notice sitting next to the Professor a representative of the Pennsylvania Railroad who might tell us something about developing men, Mr. Maxfield.

MR. H. H. MAXFIELD, PENNA. R. R.: Mr. Buell has very ably and comprehensively stated the problem which for the time being at least is keeping a great many of us awake nights. The conditions under which we are working and have been working for the past year are highly special. There is no use in our talking about selecting men now because the selection of men pre-supposes sufficient men to select from, which certainly is not the case at this time. All we can do at the present time is to take what we can get and trust that some how and some way, we will be able to get along. So I think we have got to look at this problem more from the standpoint of normal conditions as they have been and will be, rather than as they are today.

The problem of the man in the shop, on the road, or wherever he may be, to my mind, is being recognized more and more by railroad officers not only from the standpoint of increasing the efficiency of the individual workman, but also of developing these men so that we can depend upon them as permanent employees and draw upon them in the future for foremen and higher officers. On the Pennsylvania of late years this problem has been given a great deal of thought and is being solved very largely along the lines that have been mentioned by Mr. Buell. We have thoroughly equipped apprentice schools at our various shops and terminals with trained men in charge. The boys go to school four hours a week under pay. All the expenses of operating these schools are borne by the Company and we hope by this means to develop our future gang leaders, assistant foremen, foremen, etc.

For some years we have been operating correspondence schools for all employees, paying special attention to the education of the foreign born employees along very practical lines, the instructors being men who thoroughly understand this element. In fact some of them are foreigners themselves, who have become educated and not only understand the foreign side of the problem, but also are thoroughly imbued with the American spirit. Thousands of our employees are taking advantage of these courses. It is thoroughly organized and systematized and handled by a central bureau in Philadelphia and each grand division has its instructor located at its headquarters, who is closely in contact with the men.

The features of good working conditions, rest rooms, sanitary toilet, locker rooms, etc., are all being given careful consideration. A large amount of money has been as is still being spent for these purposes. As is well known the Pennsylvania Railroad is one of the pioneers in the Voluntary Relief, Savings Fund and Pension movements.

Now the problem that has bothered me, and this was referred to by Mr. Woodbridge, is not so much to get men to do this or that work efficiently as it is to develop men who in turn will become leaders themselves. The great need as I see it is for leaders and that must be the ultimate object of all our efforts. Mr. Buell has pointed out very clearly many of the conditions which we have got to meet in order to solve the problem.

PRESIDENT: It has been some time since the Club has had the pleasure of listening to Mr. Stucki.

MR. A. STUCKI: I have not had the pleasure of knowing Mr. Buell very long. I met him just about two months ago, and I can assure you, gentlemen, that he is as dear to me today as he is to any of his oldest friends.

The paper struck me very forcibly; first of all, the subject in itself. I have been in the railroad and in the manufacturing game all my life and there is no problem of greater importance than the man problem. Equally remarkable, however, is the form and the thoroughness with which every detail has been presented, and I can add nothing new. I may simply emphasize a few points, which left the deepest impression.

"He learned to make men like him so they would learn to like their work." This is the keynote of the whole question. I do not care how skillful your workman is, how resourceful and good in other respects, you must have his good will to get the best results. Neither do I care how well equipped the shop is, how many special machines are used or what system of efficiency we have introduced, we will not get a maximum efficiency, unless we have his heart, and after all it is so easy to get it. It does not cost any money—a kind look, a pleasant Good Morning, or a nod across the street will make any one feel that he has "a pretty good boss." I am personally acquainted with the efforts made to bring about good fellowship by introducing various sports and team work mentioned in the paper and again referred to by Mr. Maxfield. It is a splendid thing to create whole soul co-operative spirit.

Secondly we must have training. Naturally, some of our men are being trained to some extent. For instance, every engineer has first to serve some years as fireman before he is allowed to touch the throttle and a conductor has first to prove his merits as a brakeman. None the less, the author is exactly right when he says that locomotives are more systematically broken in than the men are.

This reminds me of an interesting reading circle, about ten of us draughtsmen formed some years ago in one of our eastern country towns. Each one of us had to read a designated railroad magazine and report weekly what we found of special interest. We met in our private rooms to discuss said topics and in this way every such evening was a source of timely information, besides being a most pleasant social gathering.

Shop men very often do not avail themselves of the opportunities offered. They come home tired and do not feel like dressing up for the night school or the Y. M. C. A. Therefore, we will have to come to day-instructions more and more, just as has been outlined by Mr. Turner tonight.

I wish Mr. Buell would give us a few more details relative to the Railway Educational Bureau of Omaha, Nebraska, how they divide their work, how much time they devote to practical training and how much to general education, also who is furnishing the laboratory, the various railway devices, the rooms, the machines and how they serve the non-residents, whether they have a system of correspondence or whether they have branches on the different division points.

I would also like to ask the author to be a little more explicit in regard to woman labor, whether he considers it beneficial or otherwise, first, from the workman's point of view and then from the railway company's perspective.

As to the question of promotion, I was glad to hear the preliminary remarks. This showed me that the author considers the "Specialty Man" really as a sort of a check only, because we cannot disregard the foreman of a department. He not only knows the main features of his men but also the personal peculiarities often so necessary to fill a new place, and the official having charge of the various departments again is the best qualified man to direct the transfers.

A square deal everywhere and especially in wages is absolutely essential and I agree with the author in every respect. He, of course, did not specially talk for the benefit of the various trainmen union members. They seem to be able to take care of themselves. At least, you do not find anywhere in history, ancient or modern, where such drastic measures were used to enforce wage legislation as we recently witnessed in our country, threatening to tie up every train, wheel and factory if the government would refuse to comply within certain demands. I have reference to the Adamson Law. But what struck me more forcibly yet is a notice which I read in the daily papers the day before yesterday to the effect that the Senate Interstate Commerce Committee declined to approve an amendment forbidding a strike pending investigation of the labor controversy, and as long as we have such conditions, the man problem will not be solved. In normal Europe they have no strikes and no disorder and speaking about individual cards mentioned by Mr. Buell, I may say that every man in Europe must carry his own record book. This book must show uninterruptedly what its owner did, and when and where, and if there is a gap, it will have to be explained before the bearer gets another job.

It was so nicely stated how the many thousand railroad employees and their families could help to improve the public opinion towards the railroads; however, they hardly would be able to improve the value and popularity of the railroad securities. It takes revenues to do that and as long as we have one legislative body to govern rates and the other legislative body to govern wages, and each one trying to do all it can for the public or the voters and as little as possible for the railroads, we are not going to improve matters in this direction.

PRESIDENT: I do not believe it was the intention of Mr. Buell that the members of this Club should go long on railroad stocks because of this paper, and I will say for the Club that I do not think we are prepared tonight for the discussion of the Adamson bill of the wage question. There may be a time when we will do that, but it is hardly here tonight. Most of us have read from time to time the excellent employees magazine issued by the B., R. & P. Railroad and Mr. Taylor, its editor, is present this evening and I am sure we would all like to hear from him.

MR. A. M. TAYLOR, B., R. & P. Ry.: I regret that I was given time for but a very brief reading of Mr. Buell's paper. He has entered into a discussion of one of the broadest and most important questions of the day. We have been passing through the age of machine efficiency, as witness his reference to the care given the purchase and performance record of a locomotive, and some efforts have been made to apply similar methods to men, without success. For man, even of the lowest type, is not a machine. He requires handling of a different nature to obtain the best results, and employers of today are fast awakening to the realization that man-development and management is the most important factor in their business.

Of the subjects mentioned by the speaker, wages, no doubt, is the one which is uppermost in the minds of the men, and especially of the unorganized element, at the present time. Leaving out of the question the unnatural conditions created by the war, making it possible for many industries to offer unusual wages, which cannot be met by others not so fortunate, every man should be paid a sum the equal of that for which he may be replaced. And by that is not meant merely the filling of his place at a desk or bench, but his replacement by one of equal ability and experience and one whose potential worth to the company in years to come is on the same level.

Perhaps the present stigma which has settled itself on certain classes of railroad employment has been brought about by the fact that some positions pay so much—no more. A man serves faithfully, efficiently, one might almost say brilliantly, for years—no position of advancement opens up, more money is refused, and he goes elsewhere—at an increased salary. And we see his place taken by one of half his ability and promise—at the same salary. Dearth of material of executive calibre in the future is bound to follow, to say nothing of the fact that his experience and that of others deters young men of ambition and ability from taking up such lines of work. After educating and training these men for years, can we afford to let them get away from us?

If it shall be developed, in the future, that the employment of mediocre ability at a low wage is more costly in the long run than the retention of those of greater efficiency at a higher figure, no doubt the change will be brought about—the increased wage to the unorganized added to that of organized labor and still more urgent reasons for increased rates afforded.

And with this will come a standardization of working hours, and an increase in working forces will make "overtime" only occasional, as fitting the peculiarities of the work.

There is a tendency, however, for men doing one class of work to compare their wages with those of another whose work involves elements of hardship and risk not found in their own. There is no weight in such comparisons. The man who prefers a "collar and tie" job has no just cause for complaint that another of equal length of service, whose work requires overalls, exposure to the elements and danger to life and limb, receives more wages than himself.

The law of supply and demand will automatically care for certain classes of unorganized labor considered at present underpaid.

Pleasant surroundings is a matter that has been receiving considerable attention. There is no doubt that it results in increased efficiency. Comfortable and sanitary working quarters are being provided, at least on some roads. I know of one which quarters its large extra gangs during the summer in well constructed tents, with careful regulations as to sanitation, which are rigidly enforced.

The Hiring and Handling of help by a central head, is a matter which would seem to offer wonderful possibilities, although in assigning this work to one man, Mr. Buell has wished a big job on him. Under this subject would come those of Fair Treatment and Opportunity for Advancement. Conversant with the capabilities of every man in the organization, the central employment board will be able to bring men from various parts of the service to fill positions in departments which have not the necessary material available.

Right now I know of a concrete instance of a good position unfilled because the department to which it belongs has no one considered competent. Yet I have no doubt that somewhere in the ranks is the man for the place, his qualifications unknown to the head of the department which is seeking him.

Just how this method could be applied to a railroad system with its activities scattered over several thousand miles of territory is a matter for careful study. Perhaps the solution would be the establishment of several such bureaus, each with a limited territory, but co-operating with each other. Such methods have been very successful in some other lines of industry.

In Harper's Magazine for December, under the caption "FITTING THE MAN TO THE JOB," Burton J. Hendrick quotes some interesting, even startling figures relative to this problem. Statistics covering the number of men hired and fired in a number of industries during one year showed that 85% of the human material that went into these shops failed to adapt itself to the work. Basing the cost of hiring a man and trying him out at from $50 to $500, the loss through this channel is enormous.

Mr. Hendrick then enlarges on the methods which have been employed in certain large industries, including the Ford plant, at which plant all help is provided by a central hiring board of forty experts which furnishes help to every department on requisition. Nor is an employe discharged by any other than this board, and then only after a thorough study of his or her peculiarities and a trial on many kinds of work.

Physical examination, which is a part of the plan, has shown men with high blood pressure employed on heavy lifting and a change has been made to more suitable work; the employe apparently crippled with rheumatism and classed as "no good" found to be suffering with fallen arches and relieved by properly fitting shoes, with splendid results; the girl with impaired hearing employed at the telephone switch-board and, naturally, inefficient, yet who developed amazing efficiency in the handling of figures.

Mr. Ford employed, in 1913 (before this plan was put in effect), about 16,000. Records showed that during this year 8,000 left or were discharged, a loss of from $500,000 to $2,000,000 a year. The year following the inauguration of the plan the number was reduced to 146.

Education, it would seem, would find its greatest field among those in clerical work. As cited by the speaker, certain roads are now doing excellent educational work. The desire for increased knowledge is not universal among employees—otherwise they would find their opportunity in the many correspondence or night schools in existence, allowing, of course, that they are endowed with the necessary determination to continue to the end in spite of the attractiveness of amusements.

Perhaps the greatest work of this kind in progress today, is being done by the National City Bank of New York. Education, among employees under 21 years of age, begins with their employment, covers a carefully worked out plan of development in fundamentals and is compulsory. Among those beyond this age, courses are not compulsory until the employe has enrolled for them, after which constant attendance and study is exacted. These courses are conducted by officers and older employes at, no doubt, considerable sacrifice and loss of time, but they are building a wonderfully enthusiastic and efficient organization. The bank has not stopped with the admonition to "Be Ambitious" —"Be Efficient." They have set a well defined mark for employees to shoot at and are making them "shoot."

In speaking of the work of a certain class of men I heard a speaker say, recently, that their work was "Uninteresting because not understood." With education along the line of work would come understanding, the progenitor of interest, liking, enthusiasm. And this is, in no sense, welfare work. It is a long-headed move on the part of the company practicing it, resulting in the development of help that is HELP.

One of the greatest dampeners on enthusiasm and ambition is the practice among certain ones of taking plans and ideas worked out by their subordinates and passing them along as their own, giving no credit to the originator. While such practice exists, no organization can attain to its maximum of efficiency.

There is one more element to be added, without which the others mentioned will fail of the greatest good. Every man-jack of us needs it, appreciates it, whether he says so or not. And that is the element of kindly encouragement which should permeate every organization from the president down. A man-to-man comradship which should exist throughout, which prompts each man to pass along a word of praise, when praise is due. For it touches what Handerson, of Cleveland, calls "That little empty spot inside" and makes for greater enthusiasm, greater effort and a pull-together-spirit. For the truly big man does not need to wrap himself in a mantle of cold reserve to sustain his dignity, and if he would that men should work *with* him instead of *for* him, give him the best that is in them, he cannot afford to overlook the power of the sincere "hand on the shoulder," for, as Riley puts it,

When a man ain't got a cent,
  And he's feeling kind of blue,
And the clouds hang dark and heavy
  An' won't let the sunshine through,
It's a great thing, O by brethren
  Fer a feller just to lay
His hand upon your shoulder
  In a friendly sort o' way.

It makes a man feel curious,
  It makes the tear drops start,
An' you sort o' feel a flutter
  In the region of the heart!
You can't look up and meet his eyes;
  You don't know what to say
When his hand is on your shoulder
  In a friendly sort o' way.

Oh, the world's a curious compound,
  With it's honey and its gall,
With its cares and bitter crosses—
  But a good world after all.
An' a good God must have made it—
  Leastways, that is what I say
When a hand is on my shoulder
  In a friendly sort o' way.

PRESIDENT: There are present a considerable number of men who could well discuss this subject, but the hour is late; but we will give opportunity to anyone who has something definite to add to the discussion.

J. A. SPIELMANN, B. & O. R. R.: I am entirely in sympathy with the sentiments as expressed in the paper read this evening. It is the ablest presentation of the subject to which I have ever listened.

It would be interesting to hear from the representatives of the different railroads here, and perhaps be a surprise to learn how much of this work has been done and is being done on some of the railroads in this part of the country. I will say, for the Baltimore and Ohio, that they realized the necessity of this work, and in an early day.

In 1880 the Baltimore and Ohio instituted a relief department for the employees. It was chartered as the Baltimore and Ohio Employees Relief Association. In 1889 the charter was taken away from them by the State of Maryland. The Company then established a Relief Department in its stead, making it a department of the Railroad. It has continued up to date, and now has about 60,000 members. We also have a Savings Department, in which employees can deposit their savings and receive 5 to 6 per cent on their deposits.

We have also a Building and Loan feature, through which employees can, if members of the Relief Department, obtain loans to build homes. We also have a Welfare Department, doing much for the welfare of the employees. Last year there was instituted a Baltimore and Ohio Base Ball League, in which each division competed with all the others, for a silver loving cup, the final game being played at Baltimore.

We have many Railroad Y. M. C. A. buildings on the line, which have proven a great benefit to the men, and are highly appreciated by them.

We have a "Safety First" Department, well organized and thorough in its work, with a Committee on each division, who have monthly meetings.

There is one feature not mentioned in the paper read this evening that is of great importance, and I believe as important as any he mentioned; in fact, I think the railroads must sooner or later give heed to it. We would have better railroad men, more satisfied employes, the railroad work in all its features more attractive, the railroads would stand better in the opinion of the Public, whom he serve, if all work possible was avoided on Sunday, and give the men a chance to be with their families.

MR. D. M. HOWE: Not being called on, I believe it is up to me to say something. I had the pleasure of reading an advance copy of Mr. Buell's paper, and can assure you it was read with a great deal of interest. The paper is very instructive and it is certainly well worthy of commendation. But one of the things I was taught years ago was that in getting up to say something you must know how to begin, what to say, and when to stop, and I believe I know the third of these items better than the other two. Some of these fellows who preceded me talked a good while. And there is just one thing I wish to say. A gentleman who can prepare and read so ably such a paper as we have listened to this evening ought to be placed on our list of Honorary Members. Therefore, I would move that Mr. Buell's name be placed on the list of Honorary Members of The Railway Club of Pittsburgh.

The motion was seconded and prevailed by unanimous vote.

MR. H. F. GILG: I believe further that the author of the paper should have a vote of thanks of this Club in appreciation of his very able paper.

This motion also was seconded and carried unanimously.

PRESIDENT: Mr. Buell, is there anything you wish to say in closing the discussion?

MR. BUELL: I want to thank you all for being so good to me. I approached this subject with a great deal of hesitation. It is such an enormous subject that I did not know just what to do. I am very earnest about this thing, and the one thing that has impressed me about this meeting tonight is the earnestness of every one here about this problem. That very indication of earnestness is the indication that it is going to be solved because there is not anything that a bunch of railroad men like this can not solve if they go after it. I am especially touched, Mr. President and fellow members of The Railway Club of Pittsburgh, by this vote making me an Honorary Member. It is worth the trip out here, aside from all the other pleasures connected with it, and I want you to know that I appreciate it.

ON MOTION, Adjourned.

J. B. Anderson
Secretary.

RAILWAY CLUB NOTES.

The following subjects were presented and discussed by the several Railway Clubs during the month of January, 1917, as noted below:

New York Railroad Club, Harry D. Vought, Secretary,
95 Liberty Street, New York, N. Y.

SUBJECT—"Accident Prevention" by Marcus A. Dow.

New England Railroad Club, Wm. E. Cade, Jr., Secretary,
683 Atlantic Avenue, Boston, Mass.

SUBJECT—"Brakes on Freight Car Equipment" by H. S. Walton.

Canadian Railway Club, Jas. Powell, Secretary,
P. O. Box 7, St. Lambert, near Montreal, Can.

SUBJECT—"Passenger Car Painting" by Thomas Marshall.

Richmond Railway Club, F. O. Robinson, Sec'y, Richmond, Va.

SUBJECT—"Glacier National Park" by L. D. Kitchell.

St. Louis Railway Club, B. W. Frauenthal, Secretary,
Union Station, St. Louis, Mo.

SUBJECT—"Electrification of Steam Railroads."

Southern & South Western Ry. Club, A. J. Merrill, Secretary,
Box 1205, Atlanta, Ga.

SUBJECT—Unknown.

Central Railway Club Buffalo, N. Y., Harry D. Vought,
Secretary, 95 Liberty Street, New York, N. Y.

SUBJECT—Annual Meeting.

The Railway Club of Pittsburgh, J. B. Anderson, Secretary,
207 Penna. Station, Pittsburgh, Pa.

SUBJECT—"The Man Problem" by Mr. D. C. Buell.

Copies of the above papers can be had upon application to the Secretary at the address given for a nominal price.

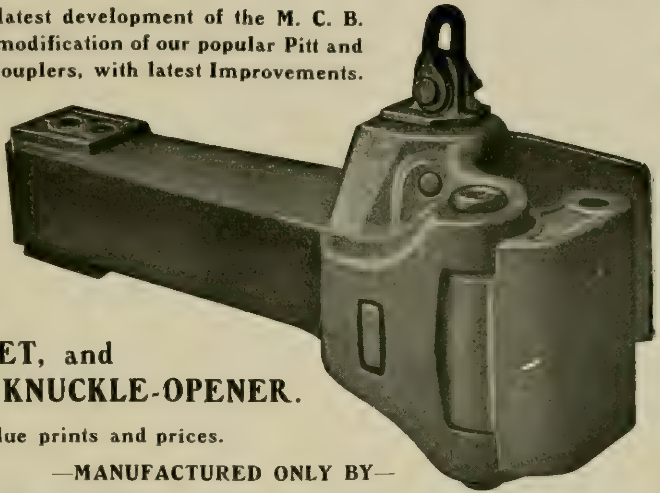
In Memoriam

U. G. DETWILER

Died October 30, 1916

THE PENN COUPLER

Our latest development of the M. C. B. Coupler, a modification of our popular Pitt and Janney X Couplers, with latest Improvements.



LOCK-
TO-
THE-
LOCK,

LOCK-SET, and
KNUCKLE-OPENER.

Send for blue prints and prices.

—MANUFACTURED ONLY BY—

THE McCONWAY & TORLEY CO.,
PITTSBURGH, PA.

This Space For Sale

PINTSCH MANTLE LIGHT

The system that has made good wherever it has been applied . . . .

SAFETY ELECTRIC LIGHT

Type "F" regulation ensures constant lamp voltage and long lamp life .

The Safety Car Heating & Lighting Co.

Chicago, Philadelphia, Washington, Boston,
St. Louis, San Francisco, Montreal

2 Rector St., New York

KING METALLIC PACKINGS

for Locomotive Piston Rods, Valve Stems & Air Pumps

SECURITY WRIST PIN
LEACH SANDERS
GOLLMAR BELL RINGER
INDESTRUCTIBLE OIL CUP
BRAIDED SWAB, ETC.

The U. S. Metallic Packing Co.
PHILADELPHIA

FIREBOX FACTS

1. Big locomotives have long wheel bases.
2. Long wheel bases must be covered by long boilers.
3. Long boilers mean excessive flue lengths.
4. Excessive flue lengths represent investment in heating surfaces of low evaporative values.
5. Shorter flues mean longer fire boxes.
6. Longer fire boxes (with combustion chambers) of the radial stay type are dangerous and introduce added stay bolt troubles.
7. The Jacobs-Shupert sectional fire box (and combustion chamber when required) supplies the means for designing locomotive boilers of correct economic proportions and at the same time for reducing maintenance problems to a minimum.

"YOURS FOR BETTER BOILERS"

Jacobs-Shupert U. S. Firebox Co.

30 Church St., New York. Works: Coatesville, Pa.

RAILWAY STEEL-SPRING COMPANY,

Springs,

Steel Tired Wheels,

Locomotive and Car Wheel Tires.

GENERAL OFFICE, 30 CHURCH STREET, NEW YORK

BRANCH OFFICES:—CHICAGO, ST. LOUIS, ST. PAUL, WASHINGTON, D. C.

Hundreds of G-E Planer Drives are in Successful Operation

The first G-E Planer Drive, built five years ago, and hundreds built since then are in use throughout this country. Repeat orders constantly testify to their splendid operating records.

Carefully consider the following advantages of this equipment:

Vastly more economical in operation and upkeep than any other existing drive.

Maximum cutting speed always sustained, giving greatly increased production.

Reverses remarkably close to a line.

Standard motor speeds 250—1000 r.p.m.

Many speed combinations, allowing slowest cutting and highest return speed to be combined.

Freedom from shocks, giving quickest reversals possible without jar.

Unexpected return of current to wires always finds motor and control apparatus ready to receive it.

Quiet operation.

Sparkless commutation.

Trouble proof control in easy reach of operator.

This equipment is conservatively rated and has ample power. Investigate the power rating of the motor you buy.

General Electric Company

GENERAL OFFICE
SCHENECTADY, NEW YORK

District Offices in

Boston, Mass.
Cincinnati, Ohio
St. Louis, Mo.
New York, N. Y.
Chicago, Ill.
Philadelphia, Pa.
Denver, Colo.
Atlanta, Ga.
San Francisco, Cal.

Sales Offices in all Large Cities 6545

STANDARD STEEL CAR COMPANY

OFFICES
General Offices: Frick Bldg., PITTSBURGH, PA.
NEW YORK: 170 Broadway
CHICAGO: Fisher Building

WORKS
BUTLER, PA.
NEW CASTLE, PA.
HAMMOND, IND.

STEEL AND COMPOSITE

FREIGHT CARS

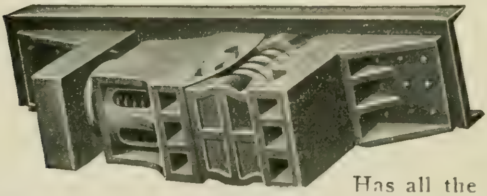
For all Classes of Service, from our Standard Designs,
or according to Specifications of Purchasers.

Steel Car Underframes

TRUCKS, BOLSTERS, BRAKE BEAMS, ETC.

Capacity 50,000 Cars per Annum

INQUIRIES SOLICITED

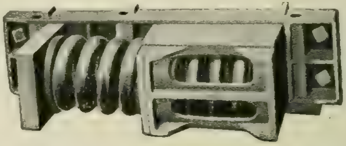


USE BUTLER
DRAFT GEARS
FRICTION RIGGING
PIPER PATENTS
200,000 lbs. Capacity.
Has all the points of a Perfect Gear.

TANDEM SPRING ATTACHMENTS
6¼x8 or 8x8 DRAFT SPRINGS
PERFECT SPRING PROTECTION

Butler Drawbar Attachment Co.

Send for Catalog CLEVELAND, OHIO



SCHAEFER
DROP-FORGED
FOUNDATION BRAKE GEAR DETAILS,
COMBINE
MORE STRENGTH WITH LESS WEIGHT

Schaefer Equipment Company

Oliver Building Pittsburgh, Pa.

STANDARD STEEL PLATFORMS

ARE IN USE BY 281 COMPANIES

SESSIONS—STANDARD FRICTION DRAFT GEARS

ARE IN USE BY 205 COMPANIES

—BOTH MADE BY—

THE STANDARD COUPLER CO.

CHICAGO: People's Gas Building NEW YORK: 30 Church St.

J-M RAILROAD SUPPLIES

Roofings
Packings
Gaskets
Pipe Coverings
Hair Felt
Smoke Jacks
Asbestos Wood
Waterproofing
Cork
Fibre Conduit
Locomotive Lagging
Flexible Armored Squirt, Tank, Car Heating, Air Brake and Air Signal Hose
Air Brake Expander Ring
Steel Car Insulation
Underground Conduit
Asbestos Cements
Brake Lining and Blocks
Electrical Supplies
Mastic Flooring
Speedometers
Fire Extinguishers
Manual Slack Take Up for Air Brakes
Vitribestos Stack Lining
Refrigerator Car Insulation

Write for Catalogs

JOHNS-MANVILLE SERVICE COVERS THE CONTINENT

H. W. JOHNS-MANVILLE COMPANY

New York and Every Large City

Union Steel Casting Company,

PITTSBURGH, PA.

Steel Cast Locomotive Frames, Driving Wheel Centers, and Miscellaneous Locomotive Castings.

Vanadium Steel Castings a Specialty

Standard Heat & Ventilation Co. Inc.

Heating Apparatus for Railway Cars and Locomotives

Car Ventilators, Storage Battery Charging. Plugs and Car Receptacles.

165 Broadway New York

Freight and Passenger

CARS

Of Every Description

Pressed Steel Specialties

Tank Cars
Mine Cars

Pressed Steel
Car
Company

New York
Pittsburgh
Chicago
St. Paul

FOR

GREATER EFFICIENCY

USE

DAVIS **SOLID-TRUSS** BRAKE BEAMS

FOR

Freight and Passenger Equipment.

ALSO

Pressed Steel Journal Box Lids.

DAVIS BRAKE BEAM CO.,

JOHNSTOWN, PA.

FRANK J. LANAHAN, Pres. CHAS. J. GRAHAM, Vice-Pres. H. L. REPLOGLE, Gen'l. Sales Rep

STUCKI
Side Bearings
SAVE WHEELS, RAILS, POWER
AVOID DERAILMENTS

A. Stucki Co.
Oliver Building
PITTSBURGH,
PA.

This Space For Sale

This Space For Sale

SUYDAM'S Protective PAINTS
For Freight Cars and Structural Steel Work
—MANUFACTURED BY—
M. B. SUYDAM COMPANY,
OFFICE AND WORKS, 61ST AND BUTLER STS.,
BELL 'PHONE, 343 FISK. PITTSBURGH, PA

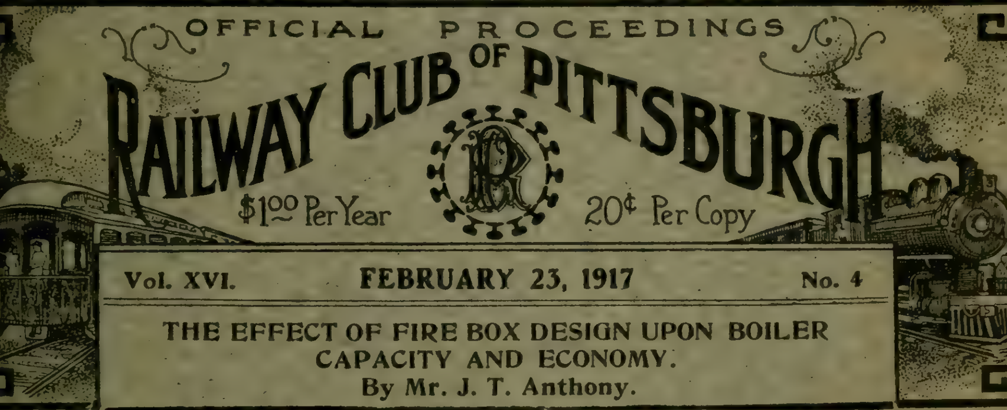
This Space For Sale.

Carnegie Library
of Pittsburgh

FOR SALE

BRADY BRASS CO.
MANUFACTURERS OF
CYPRUS BRONZE FOR LOCOMOTIVE and CAR BEARING USE
ENGINE CASTINGS BABBITT METALS
JOURNAL BEARINGS MOTOR BEARINGS
General Office and Works, 170-182 Fourteenth St. and 169-175 Fifteenth St., Jersey City, N. J.
DANIEL M. BRADY, President

SCHMIDT SUPERHEATER LOCOMOTIVES
Make firing easier Save coal and water
Haul longer trains Maintain faster schedules
LOCOMOTIVE SUPERHEATER COMPANY
30 Church St., New York. Peoples Gas Bldg., Chicago.



OFFICIAL PROCEEDINGS RAILWAY CLUB OF PITTSBURGH

$1.00 Per Year 20¢ Per Copy

Vol. XVI. FEBRUARY 23, 1917 No. 4

THE EFFECT OF FIRE BOX DESIGN UPON BOILER CAPACITY AND ECONOMY.

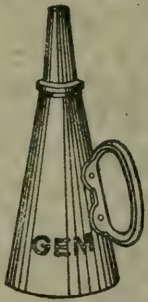
By Mr. J. T. Anthony.

SPECIAL DROP FORGINGS
STEEL CAR FORGE COMPANY
"FORGING SPECIALISTS"
PITTSBURGH NEW YORK CHICAGO

FOR SALE

Electrical Uses
ARISTOS
"COPPERWELD"
Mechanical Uses
A COPPER CLAD STEEL WIRE
Product of the COPPER CLAD STEEL CO., Pittsburgh, Pa.
Drawn and Sold Exclusively by
PAGE WOVEN WIRE FENCE CO., - - Monessen, Pa.

FOR SALE



TORCHES

Gem Torches Save You Money

Exhaustive tests by largest railway systems have proven that Gem Brazed Seam Torches do save money. Let us prove it. Send for free sample and information.

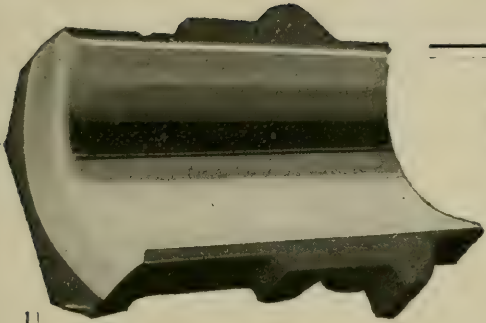
Gem Manufacturing Company
PITTSBURGH, PA.

Graham Nut Company
PITTSBURGH, PA.

MANUFACTURERS OF

Hot Pressed Nuts, Cold Punched C. & T. Nuts
Bolts, Lag Screws, Washers, Etc

This Space For Sale



Here's the King of Them All-

The product of old heads and a new plant, you always find

JOHNSON

Bronze Bearings

there with the stuff called service.

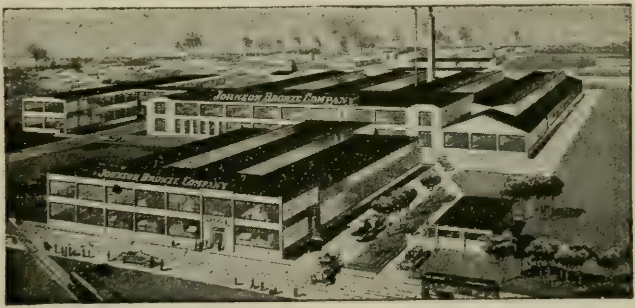
Our years of experience give us a knowledge of bronze and its alloys which is always an assurance of long and satisfary service. Our large capacity, modern methods and unique routeing system work for prompt deliveries.

We have some interesting data for you. Send for it today. It makes no difference whether you make your own bearings or not. Just write Dept. R. C.

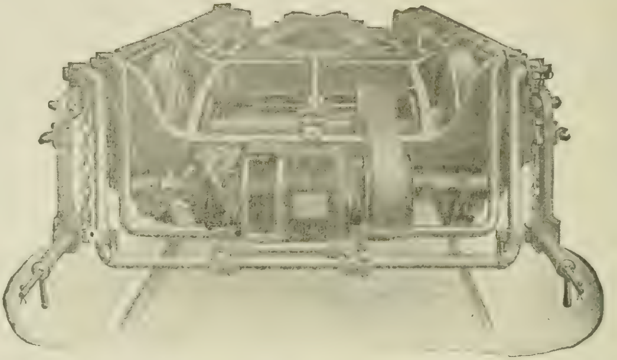
JOHNSON BRONZE COMPANY

FORMERLY—THE AMERICAN CAR & SHIP HARDWARE M'F'G. CO.
WORKS AND GENERAL OFFICES
NEW CASTLE, PA.

--and here's where it's made



THE GOULD "SIMPLEX" SYSTEM OF ELECTRIC CAR LIGHTING

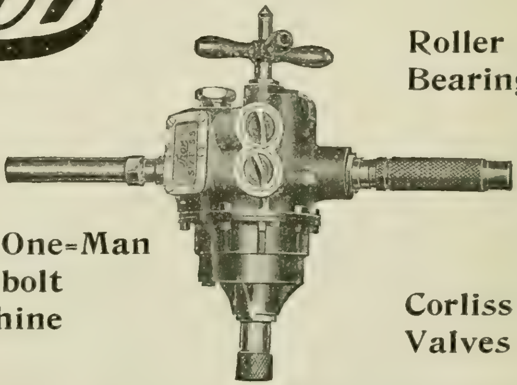


GOULD COUPLER CO.

NEW YORK

Thor

Roller-Bearing Compound Piston Air Drills



Roller Bearings

No. 32 L

The One-Man Staybolt Machine

Corliss Valves

FURNISHED ON TRIAL FREE. WRITE NEAREST BRANCH

INDEPENDENT PNEUMATIC TOOL COMPANY

Chicago : New York : Pittsburgh : Detroit : San Francisco : Birmingham : Montreal, Que.

MANNING, MAXWELL & MOORE,

ROBT. A. BOLE, MANAGER, PITTSBURGH BRANCH

PARK BUILDING

LONG DISTANCE TELEPHONE CALL. GRANT 67

Railway and Machinists' Tools and Supplies, Electric Traveling Cranes, Compressors, Pneumatic Hoists, Riveters and complete Machine Shop and Foundry Equipment

NATIONAL CAR WHEEL COMPANY

MANUFACTURERS OF

"STAR SPECIAL"

Reg. U. S. Patt. Off.

CHILLED CAST IRON CAR WHEELS

WORKS:
Rochester, N. Y. Pittsburgh, Pa.
Sayre, Pa. Cleveland, O.
New York City, N. Y.

General Offices:
PITTSBURGH, PA.
New York Office:
556 WEST 34th STREET
Phila. Office:
506 FRANKLIN BANK BLDG.

BRAKE SHOES

AMERICAN BRAKE SHOE
& FOUNDRY COMPANY

30 Church St., New York
322 So. Michigan Ave., Chicago
Chattanooga, Tenn.

This Space For Sale

NATHAN MANUFACTURING CO.
101 PARK AVE. NEW YORK

1612 Old Colony Building, Chicago.

Monitor, Simplex and Nathan Injectors for Locomotives

AND

Sight-Feed Lubricators.

All Specially arranged for High-Pressure Engines.

STEAM FIRE EXTINGUISHERS FOR SWITCHING AND YARD ENGINES.

Boiler Washers, Boiler Testers, Rod and Guide Oil Cups, Etc.

— SOLE AGENCY FOR THE —

Coale Muffler & Safety Valve Co., Inc.

SIPE'S No JAPAN OIL
TRADE MARK REGISTERED
J.B. SIPE & CO
MANUFACTURERS
ALLEGHENY, PA.

ESTABLISHED 1884

SIPE'S JAPAN OIL

"STRENGTHENS, DRIES, AND WATERPROOFS;

Add Sipe's Japan Oil And Improve the Paint".

IN DAILY USE BY ALL THE LEADING RAILROADS IN THE UNITED STATES

MANUFACTURED ONLY BY

CHICAGO ILL. **JAMES B. SIPE & CO.** PITTSBURGH, PA.

LOCOMOTIVE BLOW-OFF

DOES SATISFACTORY WORK ON MANY ROADS.

Can be worked from cab or foot board while running.

A catalog or call by Representative for the asking.

Homestead Valve Mfg. Co.,

Works: Homestead, Pittsburgh, Pa.

=: FARLOW DRAFT ATTACHMENT :=

For TWIN M. C. B. DRAFT SPRINGS
OR
FRICTION DRAFT GEARS

THE T. H. SYMINGTON CO.

New York Chicago Baltimore Rochester

BALL'S
VARNISH REMOVER

OXOLIN
REGISTERED
THE IDEAL PAINT OIL

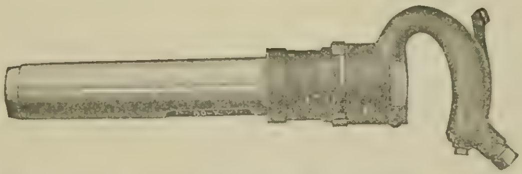
B. C.
SPIRITS

Ball Chemical Co.

CHICAGO Office,
63 W. Van Buren Street.

Fulton Bldg., PITTSBURGH, PA.

Logical Construction
is a feature of
BOYER
Pneumatic Hammers



No. 80X Boyer Riveting Hammer. Capacity 1⅜ inches.
Length overall only 21⅜ inches.

Boyer Hammers are made in three parts, cylinder, handle and valve—a construction which facilitates examination, cleaning and repairs, and extends the life of the tool indefinitely.

Write for Hammer Bulletin 124.

CHICAGO PNEUMATIC TOOL CO.

PITTSBURGH: 10 and 12 Wood St

1052 Fisher Bldg.
CHICAGO

Branches Everywhere

52 Vanderbilt Ave.
NEW YORK

H. H. HEWITT, PRESIDENT. W. H. CROFT, VICE-PRESIDENT

MAGNUS METAL

MEETS ALL HIGH-GRADE REQUIREMENTS.

IT IS THE STANDARD METAL

FOR LOCOMOTIVE WEARING PARTS,

JOURNAL BEARINGS FOR { FAST PASSENGER CAR SERVICE, HEAVY FREIGHT CAR SERVICE.

MAGNUS COMPANY

111 BROADWAY, NEW YORK.

DURABILITY COUNTS

DIXON'S SILICA GRAPHITE PAINT

is the "LONGEST SERVICE" paint. Recommended and largely used as standard by railroad economists, and engineers, throughout the entire world, for bridges, steel cars, tanks, signal apparatus etc. Made in FIRST QUALITY only. Write us for long service records and booklet No. 152-B.

Made in JERSEY CITY, N. J., by the

JOSEPH DIXON CRUCIBLE COMPANY

D X N TRADE MARK ESTABLISHED 1827 D X N TRADE MARK

RAILWAY SPECIALTIES

The National Malleable Castings Co.

CLEVELAND, CHICAGO, INDIANAPOLIS, TOLEDO,
SHARON, PA. MELROSE PARK, ILL.

MALLEABLE IRON AND STEEL CASTINGS

PEERLESS

MECHANICAL RUBBER GOODS AND PACKINGS HAVE THAT DURABILITY DEMANDED BY RAILROADS.

Peerless Rubber Mfg. Co.

31 WARREN ST. NEW YORK

BOSTON CHICAGO PHILADELPHIA MINNEAPOLIS

The Air Brake Game

today is a complicated one—and is growing more so daily. No longer will one general rule fit all cases—each individual case is a problem in itself, and as such must be met and solved. Our Engineering organization combines the experience of all railroad air brake engineers and, therefore, is specially fitted to take up and solve any and all air brake problems. Their services are free to our customers, who are requested to call them in on all air brake work, whether it be new specifications, modification of old equipment, or just ordinary, plain, every-day troubles.

Westinghouse Air Brake Co.

General Office, Wilmerding, Pa.

New York, City Investing Building; Pittsburgh, Westinghouse Building; Chicago, Railway Exchange Building; St. Louis, Boatmen's Bank Building.

Westinghouse
Electric Arc Welding Outfits

have reduced the repair costs in many railroad shops.
They save their cost in three months time.
Full information on request.—Booklet 3049-A.

Westinghouse
Electric Motors for Railroad Shops

Pressed-Steel Types for either alternating or direct current. Rugged, serviceable, efficient and long lived. Full information on request.

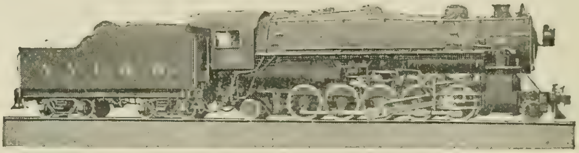
Westinghouse Electric & Manufacturing Co.

Sales Offices In All
Large American Cities

W
WESTINGHOUSE ELECTRIC

EAST PITTSBURGH
PENNSYLVANIA

2-10-2 TYPE LOCOMOTIVES



Total Weight of Engine, 352,500 pounds; Weight on Drivers, 293,000 pounds; Diameter of Drivers, 57 inches; Tube Length, 17 feet; Boiler Pressure, 190 pounds; Cylinders, 28x32 inches; Maximum Tractive Power, 71,200 pounds.

Because of its long rigid wheel base many railroad officials have had to eliminate the 2-10-2 type when considering more powerful locomotives.

Lateral motion driving axles and boxes were applied to the New York, Ontario & Western, 2-10-2 type locomotives to reduce the rigid wheel base to that which is in common use on Consolidation and Mikado type locomotives, and at the same time secure the advantages of the ten-coupled wheel arrangement with the resulting increased capacity of the locomotives.

Write us for further information regarding the lateral motion device

AMERICAN LOCOMOTIVE COMPANY

30 CHURCH STREET, NEW YORK

YOU GET THE MAXIMUM OF DURABILITY FROM OUR

SEMAPHORE ENAMEL

All colors—Write to us for samples.

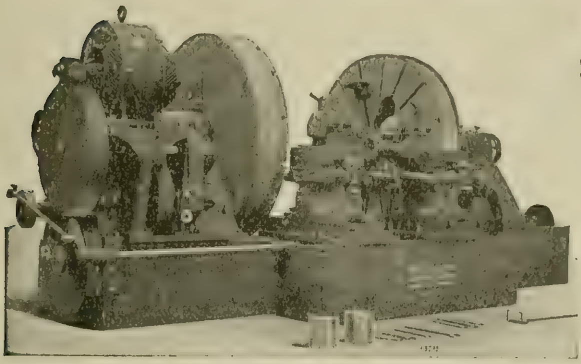
Yarnall Paint Company

MANUFACTURERS - - - PHILADELPHIA

This Space For Sale

Railroad Repair Shop Equipment

Combining all modern features for
rapid, convenient operation.



MACHINE TOOLS

STEAM HAMMERS

ELECTRIC
TRAVELING
CRANES

P. & W.
SMALL TOOLS
AND M. C. B.
GAUGES

Niles New Model Driving Wheel Lathe
Has broken all wheel shop records.

WRITE FOR CATALOGUE

NILES-BEMENT-POND CO.

111 Broadway, New York. Pittsburgh Office, Frick Building.

500 RAILROAD SHOPS

Have Adopted Thermit Welding as a Standard for Frame Repairs

The list of railroads using Thermit includes practically every system from the small road having only a few locomotives to the largest system having many thousand locomotives.

The superheated liquid Thermit steel is produced in bulk and poured all at once into a mold surrounding a broken section, resulting in the perfect amalgamation of the Thermit steel with the parts with which it comes in contact. The fact that those parts are first preheated, makes the weld doubly sure.

Remember that the greatest railway systems in the world use hundreds of thousands of pounds of Thermit. They do not use it for any reason except that it "delivers the goods," and has proved itself the most profitable investment.

Full information is given in our instructive pamphlet No. 2167, "Thermit Locomotive Repairs," and shows how effectively and economically the process can be used. Send for a copy today.

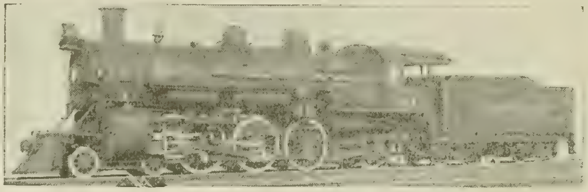
GOLDSCHMIDT THERMIT COMPANY

120 BROADWAY, NEW YORK

329-333 Folsom St., San Francisco; 103 Richmond St., W.,
Toronto, Ont.; 7300 So. Chicago Ave., Chicago

THE BALDWIN LOCOMOTIVE WORKS

PHILADELPHIA, PA., U. S. A.



LOCOMOTIVES

OF EVERY DESCRIPTION

Electric Motor and Trailer Trucks

SECURITY

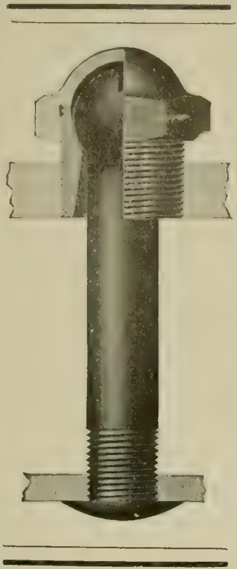
SECTIONAL ARCH

Makes staybolt inspection easy.
Saves flue troubles.
Reduces engine failures.
Easy to apply and remove.
Small brick of light weight.
Cools off quickly.
Many other good features.

AMERICAN ARCH COMPANY

30 Church Street,
New York

McCormick Building,
Chicago



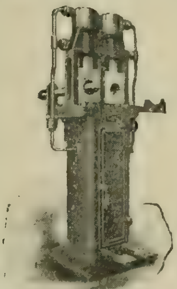
The Best Staybolt
FOR LOCOMOTIVE FIREBOXES

Railroads Are Now Using
The Tate Flexible Staybolt
At the Rate of
1,250,000 A YEAR

Our Services Are Always
At Your Command

FLANNERY BOLT CO.
Vanadium Building
PITTSBURGH, PENNA.
B. E. D. Stafford, General Manager

J. Rogers Flannery & Co.
SELLING AGENTS
Vanadium Building
PITTSBURGH, PENNA.



The Draper Manufacturing Co.
Manufacturers of
PNEUMATIC FLUE WELDERS

For Scarfing, Welding and Swedging Boiler Flues up to 4" Diameter.

Pneumatic Tube Welding Machines for Welding and Swedging Superheater Tubes.

Flue Reclaiming Equipment used in connection with Pneumatic Flue Welders.

HUNT-SPILLER IRON
HAS THE
STRENGTH AND WEARING QUALITIES
THAT ARE ABSOLUTELY NECESSARY IN
LOCOMOTIVE CASTINGS
PRICES MODERATE RESULTS GREAT
Manufactured Only By
Hunt-Spiller Manfg. Corporation
W. B. LEACH, President and Gen'l Manager.
J. G. PLATT,
Sales Manager.
OFFICE AND WORKS:
383 DORCHESTER AVENUE
SO. BOSTON, MASS.

GALENA-SIGNAL OIL COMPANY

FRANKLIN, PENNA.

Sole manufacturers of celebrated

GALENA LUBRICANTS

PERFECTION VALVE and SIGNAL OILS

and

Galena Railway Safety Oil

Manufactured for

STEAM AND ELECTRIC RAILWAY USES EXCLUSIVELY

Guaranteed Cost **Expert Service Free**

CHARLES MILLER,
Chairman.

S. A. MEGEATH,
President.

FORT PITT MALLEABLE IRON CO.

PITTSBURGH, PENNA.

MANUFACTURING SPECIALISTS
OF MALLEABLE CASTINGS
FOR THE RAILROAD AND
CAR COMPANY TRADE.

FEATURES

Superior Quality

Expeditious Delivery

Consistent Price

INDEX—ADVERTISERS.

NAME	Page
American Arch Co.	x
American Brake Shoe & Foundry Co.	iii
American Locomotive Company	viii
Baldwin Locomotive Works	x
Ball Chemical Co.	v
Brady Brass Co.	Front Cover
Butler Drawbar Attachment Co.	xviii
Chicago Pneumatic Tool Co.	v
Davis Brake Beam Co.	xxi
Dixon, Jos., Crucible Co.	vi
Flannery Bolt Co.	xi
Fort Pitt Malleable Iron Co.	xii
Galena Signal Oil Co.	xii
General Electric Co.	xvii
Gem Manufacturing Co.	Front Cover
Goldschmidt Thermit Co.	ix
Gould Coupler Co.	ii
Graham Nut Company	Front Cover
Homestead Valve Mfg. Co.	iv
Hunt-Spiller Mfg. Co.	xi
Independent Pneumatic Tool Co.	ii
Jacobs-Shupert U. S. Fire Box Co.	xvi
Johns-Manville Co.	xix
Johnson Bronze Co.	i
Locomotive Superheater Company	Front Cover
Magnus Company	vi
Manning, Maxwell & Moore	iii
McConway & Torley Company	xv
Nathan Manufacturing Co.	iv
National Car Wheel Co.	iii
National Malleable Castings Co.	vi
Niles-Bement Pond Co.	ix
Page Woven Wire Fence Co.	Front Cover
Peerless Rubber Mfg. Co.	vi
Pressed Steel Car Co.	xx
Railway Steel Spring Co.	xvi
Safety Car Heating & Lighting Co.	xvi
Schaefer Equipment Co.	xviii
Sipe, James B., & Co.	iv
Standard Coupler Co.	xix
Standard Heat & Ventilation Company, Inc.	xix
Standard Steel Car Co.	xviii
Steel Car Forge Co.	Front Cover
Stucki Co., A.	xxi
Suydam, M. B. Co.	Back Cover
The T. H. Symington Co.	v
The Draper Manf'g Co.	xi
The U. S. Metallic Packing Co.	xvi
Union Spring & Mfg. Co.	xiv
Union Steel Casting Co.	xix
Westinghouse Air Brake Co.	vii
Westinghouse Electric & Mfg. Co.	vii
Yarnall Paint Co.	viii

Union Spring & Manufacturing Co.

SPRINGS

Kensington All Steel Journal Boxes

PRESSED STEEL JOURNAL BOX LIDS

STEEL CASTINGS

Lightest and Strongest M. C. B.
Journal Boxes Made.

WORKS:
NEW KENSINGTON, PA.

GENERAL OFFICE:
First National Bank Bldg., Pittsburgh, Pa.

NEW YORK - 50 Church Street.
CHICAGO - Fisher Building.
ST. LOUIS - Missouri Trust Building.
RICHMOND, VA., AMERICAN NATIONAL BANK BUILDING.
LOUISVILLE, KY., 42 Todd Building.

OFFICIAL PROCEEDINGS

OF

The Railway Club of Pittsburgh

Organized October 18, 1901.

Published monthly, except June, July and August, by The Railway Club of Pittsburgh, J. B. Anderson, Secretary. General Offices, Penna. R. R., Pittsburgh, Pa.

Entered as Second Class Matter February 6, 1915, at the Postoffice at Pittsburgh, under the Act of March 3, 1879.

Vol. XVI.
No. 4.

Pittsburgh, Pa., Feb. 23, 1917.

$1.00 Per Year
20c Per Copy

OFFICERS FOR 1916—1917

President
J. G. CODE,
General Manager, W. P. T. R. R.,
Pittsburgh, Pa.

First Vice President
H.H. MAXFIELD,
Supt. Motive Power, P. R. R.,
Pittsburgh, Pa.

Second Vice President
D. M. HOWE,
Paint Expert,
Pittsburgh, Pa.

Secretary
J. B. ANDERSON,
Chief Clerk, Supt. M. P., P. R. R.,
Pittsburgh, Pa.

Treasurer
F. H. STARK,
Genl. Supt., Montour R. R.,
Coraopolis, Pa.

Executive Committee

L. H. TURNER, Supt. Motive Power, P. & L. E. R. R., Pittsburgh, Pa.
D. J. REDDING, Asst. Supt. Motive Power, P. & L. E. R. R., McKees Rocks, Pa.
F. R. McFEATTERS, Supt. Union R. R., East Pittsburgh, Pa.
A. G. MITCHELL, Supt. Monon. Div., Penna. R. R., S. S., Pittsburgh, Pa.
F. M. McNULTY, Supt. Motive Power, Monon. Conn. R. R., Pittsburgh, Pa.

Finance Committee

STEPHEN C. MASON, Secretary, The McConway & Torley Co., Pittsburgh, Pa.
E. K. CONNEELY, Asst. to Vice President, P. & L. E. R. R., Pittsburgh, Pa.
CHAS. A. LINDSTROM, Asst. to President, Pressed Steel Car Co., Pittsburgh, Pa.
L. C. BIHLER, Traffic Manager, Carnegie Steel Co., Pittsburgh, Pa.
WALTER V. TURNER, Asst. Manager,
Westinghouse Air Brake Co., Wilmerding, Pa.

Membership Committee

FRANK J. LANAHAN, President, Fort Pitt Malleable Iron Co., Pittsburgh, Pa.
A. STUCKI, Engineer, Pittsburgh, Pa.
C. O. DAMBACH, Supt., W. P. T. R. R., Pittsburgh, Pa.
HARRY HOWE, Inspector of Castings, Pressed Steel Car Co., McKees Rocks, Pa.
R. L. KLEINE, Chief Car Inspector, P. R. R., Altoona, Pa.
B. E. D. STAFFORD, General Manager, Flannery Bolt Company, Pittsburgh, Pa.
SAMUEL LYNN, Master Car Builder, P. & L. E. R. R., McKees Rocks, Pa.

Entertainment Committee

D. H. AMSBARY, District Manager, Dearborn Chemical Co., Pittsburgh, Pa.
HARRY MURDOCH, President, H. Murdoch & Co., Pittsburgh, Pa.
E. C. SATTLEY, General Manager, Page Woven Wire Fence Co., Monessen, Pa.

Past President

J. H. McCONNELL	October, 1901, to October, 1903.
L. H. TURNER	November, 1903, to October, 1905.
F. H. STARK	November, 1905, to October, 1907.
* H. W. WATTS	November, 1907, to April, 1908.
D. J. REDDING	November, 1908, to October, 1910.
F. R. McFEATTERS	November, 1910, to October, 1912.
A. G. MITCHELL	November, 1912, to October, 1914.
F. M. McNULTY	November, 1914, to October, 1916.

* Deceased.

Meetings held fourth Friday of each month, except June, July and August.

PROCEEDINGS OF MEETING, FEBRUARY 23, 1917.

The regular monthly meeting of The Railway Club of Pittsburgh was called to order by Mr. J. G. Code, President at 8 o'clock P. M., at the Commercial Club rooms.

The following gentleman registered:

MEMBERS.

Amsbary, D. H.
Anderson, A. E.
Anderson, J. B.
Anderson, G. S.
Anthony, J. T.
Arnold, J. G.
Babcock, F. H.
Barth, J. W.
Berghane, A. L.
Blakely, T. M.
Bosley, N. D.
Brewer, W. A.
Buffington, W. P.
Caine, C. D.
Clark, C. C.
Code, J. G.
Crenner, J. A.
Emery, E.
Endsley, Louis E.
Farquhar, L. C.
Ferren, R. O.
Flinn, R. H.
Forrest, C. H.
Foster, John
Frey, A. R.
Fulton, A. M.
Gale, C. H.
Geisler, Joseph J.
Graham, R.
Grieve, R. E.
Gross, C. H.
Grow, C. D.
Guay, John W.
Haver, W. M.
Haynes, J. E.
Hoffman, C. T.
Howe, D. M.
Johnson, W. M.
Kelly, H. B.
Kohl, H. J.
Krepps, T. S.
Kummer, Joseph H.
Lanahan, J. S.
Lehr, H. W.
Llewelyn, W. R.
Long, R. M.
Lynn, Saml.
Marshall, W. T.
Mason, Stephen C.
Miller, George H.
Mitchell, John
Morris, H. W.
McAbee, W. S.
McCollum, G. C.
McDonnell, F. V.
McIntyre, R. C.
McKinstry, C. H.
McNulty, F. M.
Neff, John P.
O'Connor, M.
Pehrson, A. K.
Platt, J. G.
Pratt, I. D.
Ralph, J. E.
Redding, D. J.
Robbins, F. S.
Ryder, G. E.
Schaich, Wm. L.
Sewell, H. B.
Sleeman, W. C.
Smith, M. A.
Smithson, A. D.
Stillings, Wm.
Taylor, H. G.
Taylor, James
Tennant, S. H.

Turner, L. H.
Walker, E. H.
Walther, G. C.
Warne, J. C.
Watkins, G. H.
Widmeier, L. W.
Williamson, J. A.
Wright, John B.
Zimmerman, S.

VISITORS.

Benson, R. W.
Byerson, Chas. E.
Fischer, Chas. L.
Galloway, G. R.
Hull, K. G.
Katzin, William
Kistler, H. D.
Kulonsek, O.
Kulonsek, V.
Long, E. T.
Moyer, A. S.
Murphy, W. J.
McAnulty, S. G.
McCallister, M. M.
Naylor, G. F.
Parkin, H. McB.
Petterson, L.
Pfahler, F. P.
Ryde, H. H.
Seley, C. A.
Stenson, G. A.
Thomas, J. W.
Thomas, H. N.
Turk, L. E.
Wiltshire, W. E.
Wolf, M.

PRESIDENT: We will dispense with the roll call and with the reading of the minutes, which will be approved as submitted for publication unless there is objection.

The Secretary read the following applications for membership:

Bayley, Harry P., Assistant General Manager, The Buda Company, Railway Exchange, Chicago, Ill. Recommended by J. G. Code.

Byerson, Chas. E., Draftsman, Pressed Steel Car Co., 24 South Euclid Avenue, Bellevue, Pa. Recommended by Harry Howe.

Campbell, Argyle, President, Enterprise Railway Equipment Co., 1153 Rookery Building, Chicago, Ill. Recommended by Frank J. Lanahan.

Converse, Paul D., Instructor in Commerce, University of Pittsburgh, Grant Boulevard, Pittsburgh, Pa. Recommended by John F. Lent.

DuBarry, E. G., Mechanical Engineer, W. P. Terminal Railway, 5860 Marlborough Street, Pittsburgh, Pa. Recommended by H. F. Grewe.

Katzin, William, Draftsman, Pressed Steel Car Company, 701 Broadway, McKees Rocks, Pa. Recommended by George C. McCollum.

Meyer, Wendel J., Draftsman, Standard Steel Car Co., 216 East Penn Street, Butler, Pa. Recommended by A. Christianson.

McBride, Paul A., President, Pittsburgh Knife & Forge Co., 709 Belmont Street, Pittsburgh, Pa. Recommended by J. A. Crenner.

McCarty, Dale, Mechanical Representative, Enterprise Railway Equipment Company, 1153 Rookery Building, Chicago, Ill. Recommended by A. M. Fulton.

Nuzum, W. A., Master Mechanic, A. & S. R. R., 438 Dewey Street, Pittsburgh, Pa. Recommended by J. A. Crenner.

Shook, W. F., General Purchasing Agent, Central Tube Co., First National Bank Building, Pittsburgh, Pa. Recommended by E. E. Root.

Simonson, S., Draftsman, Standard Steel Car Company, 314 Locust Street, Butler, Pa. Recommended by A. Christianson.

Trainer, M. N., Salesman, American Brake Shoe & Foundry Co., 6325 Douglas Avenue, Pittsburgh, Pa. Recommended by F. M. McNulty.

Wolf, Morris, Draftsman, Pressed Steel Car Co., Engineering Department, McKees Rocks, Pa. Recommended by Harry Howe.

Warden, William, Superintendent Steam & Light, Carbon Steel Co., 7141 Hermitage Street, Pittsburgh, Pa. Recommended by E. E. Root.

VonKrogh, F. F., Draftsman, Standard Steel Car Company, 606 N. McKean Street, Butler, Pa. Recommended by A. Christianson.

PRESIDENT: Gentlemen, when these applications have been passed upon by the Executive Committee and upon payment of one years dues, the applicants will become members of the Club.

I believe we have no reports of committees which are expected at this meeting.

Our Secretary wrote me a letter which I received this morning in which he stated he will be unable to be with us tonight on account of press of other business. As this is his first offense along that line in more than five years I suppose we can excuse him, particularly when he furnishes us so excellent a substitute.

MR. D. M. HOWE: Mr. President and fellow-members: Some two or three weeks ago, at a gathering of the officials of this organization, our worthy treasurer made a request—to be more explicit about it, it was during the time of this Young Men's Christian Association campaign—and that request was this: Mr. Stark had made a promise, or partly so, to one of the prominent men of Pittsburgh who had taken quite an interest in this campaign fund that this Club would make an appropriation of $200 to this very worthy cause. As it seemed to have the approval of the officers and president at that time, I would make a motion that this Club appropriate $200 to the Fund of the Y. M. C. A. of Pittsburgh.

Agreed to unanimously.

PRESIDENT: "The Effect of Fire Box Design Upon Boiler Capacity and Economy" is the subject of the talk this evening, and it is my privilege and pleasure to introduce Mr. J. T. Anthony, Assistant to the President, American Arch Company.

THE EFFECT OF FIREBOX DESIGN UPON BOILER CAPACITY AND ECONOMY.

By J. T. Anthony.

Locomotive hauling capacity depends upon boiler steaming capacity. Boiler steaming capacity is limited primarily by the amount of heat that can be made available in the firebox. Both the capacity and the efficiency of the boiler are determined largely by the capacity and efficiency of the firebox as a heat generator.

The locomotive boiler consists of a furnace for the liberation of heat, and heating surfaces for the absorption of heat. With the present design of boiler, the heating surfaces are much more efficient than the furnace; and the low boiler efficiencies commonly obtained are due to defective furnace design, rather than to arrangement or extent of heating surfaces.

High boiler capacity is now obtained at a sacrifice in efficiency, due to the inability of the firebox to burn the coal completely. If the limitations in this direction could be removed, it would be possible to get high efficiency with high capacity. The heating surfaces are not being forced to their capacity; but the grate and combustion chamber space are too often being forced far beyond their capacity, for economic operation.

* * * * *

Figure 1 shows average boiler efficiency and distribution of heat losses on the modern locomotive boiler equipped with superheater and brick arch. The losses due to the furnace are:

1. Combustible in ash,
2. Radiation through grates and ashpan,
3. Unburned hydrocarbon gases,
4. Sparks and cinders,
5. Incomplete combustion (CO).

The heat lost in front end gases consists of—heat in dry front end gas,

heat in moisture from burning hydrogen in coal, and heat in moisture from coal and air.

These front end heat losses are for the most part unavoidable; though part of this loss is due to the heating surface inefficiency and part to the furnace.

1. COMBUSTIBLE IN ASH—due partly to character of coal and to grate design and method of firing. Loss of this nature is generally small,—not amounting to more than 1 to 1½ per cent.
2. RADIATION THROUGH GRATES AND ASHPAN—Under average conditions of firebox temperatures, from 3 to 6 per cent. of the heat contained in the coal is radiated from the fuel bed through the air openings in the grates. A part of this radiant heat is absorbed by the grate-bars, and is picked up by the inrushing air and carried back into the firebox. A portion of the heat which strikes the ashpan is also utilized in heating the air that goes into the furnace. The heat radiation from the boiler shell is very small in a

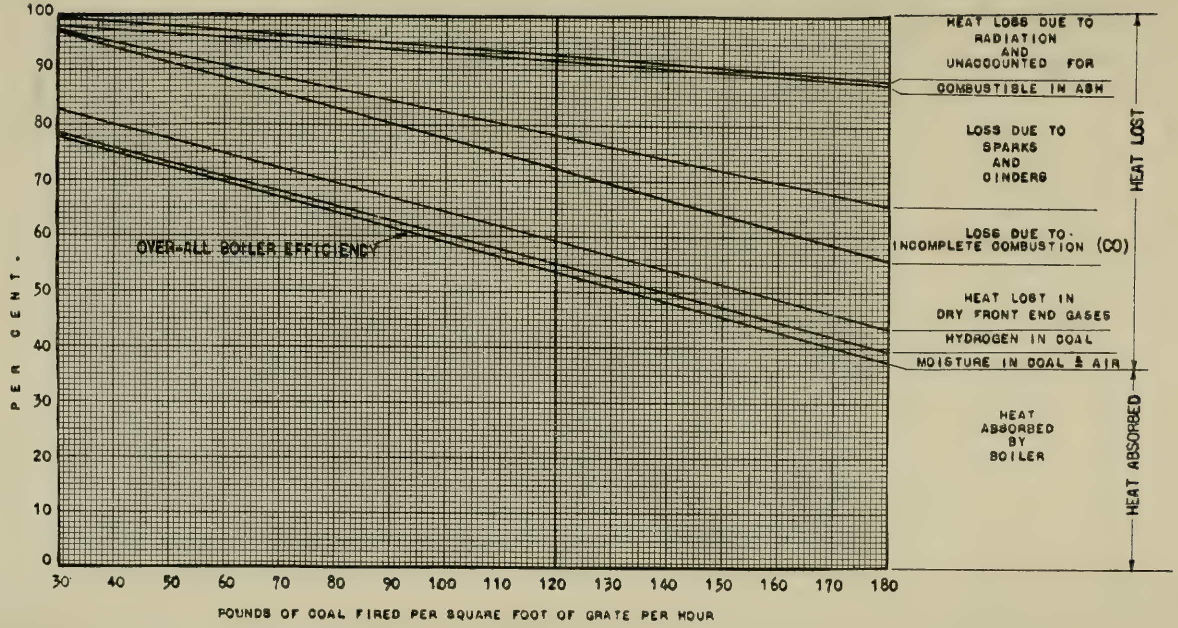


FIG. 1

HEAT LOSSES AND BOILER EFFICIENCY AS AFFECTED BY RATE OF COMBUSTION.

well-lagged boiler, though it will vary with weather conditions. At a conservative estimate, two to five per cent. of the heat is lost by radiation.

3. UNBURNED HYDROCARBONS—which account for a large part of the so-called "unacounted-for" losses. These gases are distilled from the green coal and burn above the fuel bed. To burn them completely, it is necessary to provide an excess of oxygen above the fuel bed; to mix thoroughly, and to have a large combustion chamber and long flameway. Even with these provisions, it is very difficult to burn some of the heavy hydrocarbons, which are driven off in the form of tarry vapors.

4. SPARKS AND CINDERS—are responsible for the largest heat loss at high rates of combustion. This loss can be greatly reduced by increasing the grate area and reducing the velocity of the draft through the fuel bed. Refractory baffles, to break up and deflect the cinders; and combustion chambers of ample volume and length, wherein the fine particles can burn, will cause a further reduction in these losses.

5. CARBON MONOXIDE (CO)—This gas is unavoidably formed in the fuel bed, and must be burned in the combustion chamber space. Its formation can be reduced by providing grate area sufficient to prevent high rates of combustion, and to allow a light fire to be carried; thereby insuring an ample air supply, both in the fuel bed and in the firebox space above. Once formed, the gas can be completely burned only by *mixing* with an excess of oxygen and providing ample combustion chamber space.

The sum total of these losses represents the amount of heat contained in the coal that is not liberated by the furnace, and is a measure of the furnace efficiency.

In Figure 2, Curve 1 shows this average furnace efficiency, for a modern locomotive; and Curve 3, the over-all boiler efficiency. The difference between furnace efficiency and boiler efficiency represents heat that is liberated in the firebox—but is not absorbed by the heating surfaces. The greater portion of this is unavailable for absorption, and the small part available is rejected by the heating surfaces.

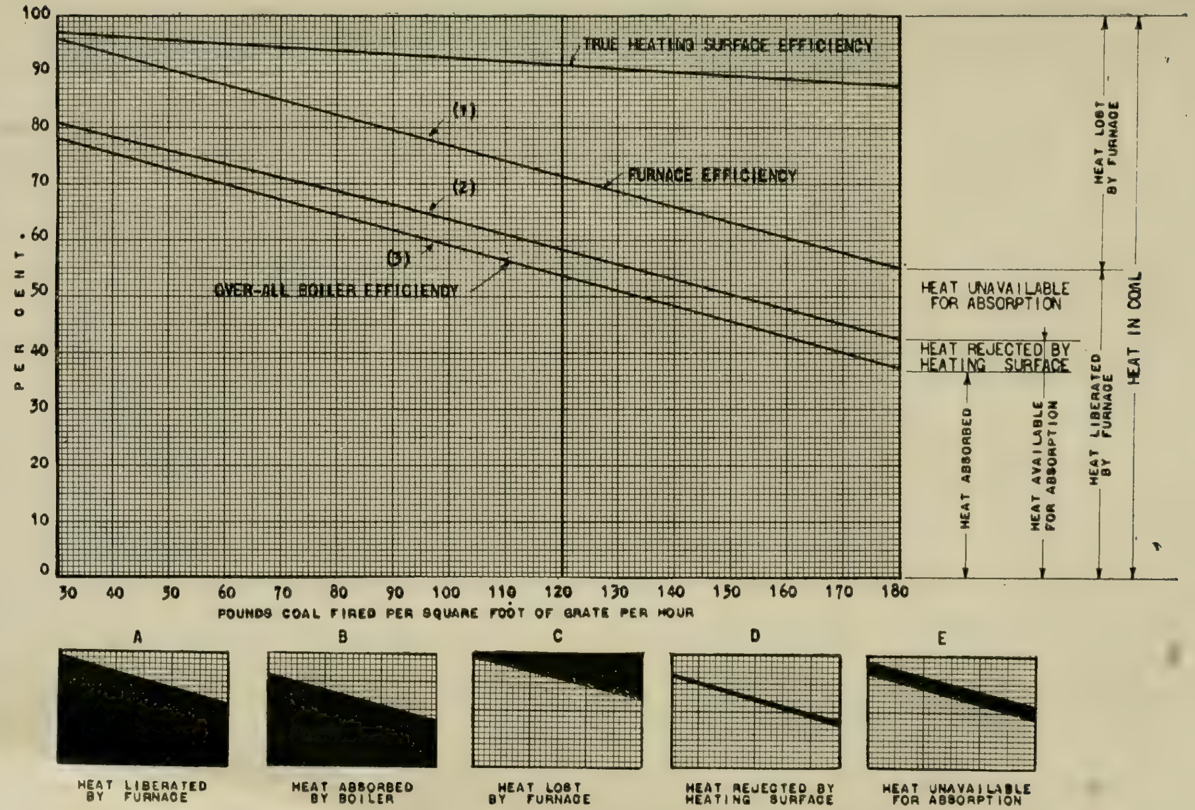


FIG. 2

SHOWING EFFICIENCY OF HEATING SURFACE, FURNACE AND BOILER - ALSO DISTRIBUTION OF HEAT LOSSES.

The heat required to raise the products of combustion from the temperature of the atmosphere to the temperature of the steam in the boiler is unavailable for absorption and cannot be charged against the heating surfaces. It can be (and often is) charged against the furnace,—when it is considered the function of the furnace to liberate and *make available* the heat contained in the coal. Such a procedure, however, does not give the true furnace efficiency,—unless the air used for combustion is preheated to the temperature of the steam in the boiler.

The amount of unavailable heat increases as the air supply per pound of coal increases; and the heat absorbed by the air used in excess of the theoretical requirements could be properly charged against the furnace. In the present instance, such a course would reduce the furnace efficiency 3 per cent. at the low rate and ½ of 1 per cent at the highest rate of combustion.

The space between Curves 1 and 2 represents the percentage of heat that is unavailable for absorption, while the space between Curves 2 and 3 represents the percentage of heat that is available for absorption but is lost through inefficiency of the heating surfaces.

The ratio of heat absorbed to heat available for absorption gives us the true heating surface efficiency,—which is shown by the curve at the top of the chart. With an over-all boiler efficiency ranging from 78 to 38 per cent., and furnace efficiency varying from 95 to 55 per cent., we have a heating surface efficiency of from 97 to 88 per cent.; while from 15 to 12 per cent. of the heat is unavoidably lost.

The small diagrams in Figure 2 show clearly this heat distribution. The height of each rectangle represents the total heat contained in the coal (or 100 per cent.); and the shaded portions, the varying amounts absorbed or lost, as the rate of combustion increases from 30 to 180 pounds of coal per square foot of grate per hour. The shaded portion of "C" represents the heat lost by the furnace; "D", the heat lost by the heating surfaces; and "E", heat unavailable for absorption, that is partly chargeable to the furnace.

Comparisons of "C", "D" and "E" clearly indicate that low boiler efficiency is due almost entirely to low furnace efficiency, and that the heating surfaces have relatively a high efficiency. The sum of "D" and "E" represents the total front end heat losses; but "E" (which represents the greater part of this) is unavoidable and will always exist, regardless of the length of flues employed.

This heat can be utilized only by some auxiliary apparatus; and so far as boiler design is concerned, can be reduced to a minimum by providing a furnace that will give perfect combustion with a minimum air supply. The grounds for improvement in locomotive capacity and efficiency lie largely within the firebox; and efforts to increase present capacity or efficiency by the use of extremely long flues or larger flue heating surfaces are bound to result in failure.

Grate area, firebox volume and gas mixing devices are the three factors that make for high firebox capacity and efficiency. The present design locomotive, with long wheel-base and trailer truck, offers every opportunity for designing a furnace that will not be deficient in these respects. There is a limit, of course, to the size of grate that a fireman can keep covered; but the mechanical stoker has removed this limitation, and larger grates than is now the practice could be used to advantage.

Grate Area.

The grate area should be large enough to provide for the generation of the maximum amount of heat required, at moderate rates of combustion. This makes it possible to carry a light fire, thereby reducing the resistance of the fuel bed to the flow of air and insuring an ample supply of oxygen in the fuel bed and in the combustion space above. Reducing the rate of combustion decreases the draft velocity through the fuel bed, and lessens the spark-and-cinder loss. Light fires, by increasing the air supply, reduce the formation of carbon monoxide in the fuel bed and eliminate the loss due to this source of incomplete combustion. In addition, large grates mean large radiating surfaces; and this, as will be shown later, is a vital factor in firebox evaporation.

Firebox Volume and Combustion Chambers.

We think of coal as burning on the grates; but, as a matter of fact, a large portion burns above the fuel bed in the form of gas. Consider the case of a large boiler such as is used on a Pacific or Mikado type engine,—with 70 square feet of grate, 311 cubic feet of firebox volume, 232 square feet of firebox heating surface and 22-foot tubes, with 5,280 square feet of tube and superheating surface—the firebox being without a combustion chamber but equipped with brick arch; and the coal used being bituminous, with 57 per cent. fixed carbon, 35 per cent. volatile and a heat value of 14,400 B. T. U. per pound.

At a rate of combustion of 120 pounds of coal per square foot of grate per hour, 8,400 pounds were fired (which is equivalent to 140 pounds per minute or 2⅓ pounds per second). If all the fixed carbon burned on the grate, there would be liberated 58 per cent. of the heat contained in the coal,—while 42 per cent. would be liberated by the volatile combustible burning above the fuel bed.

However, all of the fixed carbon does not burn on the grate. Tests indicate that often there is as much as 80 per cent. of the fixed carbon incompletely burned to CO; and in order to avoid a large heat loss, this CO must be mixed with sufficient oxygen to enable it to be completely burned in the combustion chamber space above the fuel bed.

Assume, for example, that 50 per cent. of the fixed carbon is completely burned on the grates and 50 per cent. is incompletely burned to CO. The gases arising from the fuel bed will have the composition, weight and volume shown in the table below:

COMPOSITION AND VOLUME OF GASES IN FIREBOX, WHEN BURNING 120 POUNDS OF COAL PER SQUARE FOOT OF GRATE PER HOUR, WITH AN AIR SUPPLY OF 12¼ POUNDS, AND ONE-HALF OF FIXED CARBON COMPLETELY BURNED ON THE GRATES. FIREBOX TEMPERATURE = 2200°F.

			Arising From Fuel Bed		**Combustion Completed**	
GAS	SYMBOL	Lbs. Per Sec.	Cu. Ft. Per Sec.	Per Cent. Vol.	Cu. Ft. Per Sec.	Per Cent. Vol.
*Ethane	C_2H_6	.50	38	1.87	0	0
Carbon Monoxide	CO	1.55	107	5.27	0	0
Carbon Dioxide	CO_2	2.44	107	5.27	290	14.53
Nitrogen	N_2	21.96	1517	74.73	1517	76.06
Oxygen	O_2	3.99	242	11.92	55	2.75
Water Vapor	H_2O	.16	17	.84	131	6.56
Sulphur Dioxide	SO_2	.07	2	.10	2	.10
Totals		30.67	2030	100.00	1995	100.00

*Ethane assumed to represent average composition of hydrocarbons.

Under these conditions, only 40 per cent. of the heat would be liberated on the grate, while 60 per cent. would be liberated by the burning of the gases in the combustion chamber space.

We have assumed that the combustion in the firebox is complete. Under the conditions, however, perfect combustion could not be obtained. The table shows that there is an excess of 2.76 per cent. free oxygen in the final products of combustion; but this is not sufficient to guarantee complete combustion, on account of the presence of the large volumes of inert gases, which interfere with the mixing of the oxygen with the combustibles; and also on account of the short time available for combustion of each particle of gas, and limited flameway and combustion chamber volume.

The velocity with which the combustible gases burn depends upon the volume percentages of the combustible and the oxygen present. For instance, with the gases arising from the fuel bed containing 5 per cent. CO and 12 per cent. oxygen, the velocity of combustion would be proportional to $5^2 \text{ x } 12 = 300$.

Where combustion is nearly complete and the gases contain—say, 1 per cent. CO and 3 per cent. O, the velocity of combustion would be proportional to $1^2 \text{ x } 3 = 3$; or, it would be 100 times more rapid in the first than in the second case. This slowness of combustion can be offset by providing long flameway and ample combustion chamber space; but in the absence of these requirements, combustion must be speeded up by increasing the supply of oxygen, if perfect combustion is to be obtained.

As shown, the total volume of gases evolved per second is more than 2,000 cubic feet. The firebox has an effective volume of 285 cubic feet,—which means that the firebox is being filled and re-filled with gases about seven times per second; or, that the time available for the combustion of each particle of gas will average less than one-seventh of a second.

Under the above conditions, if perfect combustion had been obtained and all of the heat liberated, each cubic foot of firebox volume would have evolved heat sufficient to produce 7½ boiler horse power perhour; and each square foot of grate, 20 horse power per hour.

As a matter of fact, however, the over-all boiler efficiency was only 54 per cent.; and the boiler horse power of 1956 was developed at a rate of 4 H. P. per cubic foot of firebox volume and 11 H. P. per square foot of grate per hour.

The large volume of gases evolved and the amount of heat generated by the burning of these gases emphasize the importance of firebox volume and combustion chamber space. The fuel bed is but little more than a gas producer,—and adequate provisions must be made for burning these gases, if perfect combustion and high capacity are to be obtained.

Mixing Devices.

Merely supplying an excess of oxygen above the fuel bed is not sufficient to guarantee perfect combustion of the gases,—they must be intimately *mixed* with the oxygen and given *time* to burn. Gases tend to mix by diffusion; but under the conditions prevailing in an ordinary firebox, such mixing takes place to a very limited extent, and must be brought about by some artificial means,—such as an arch or baffle wall. The value of such a device increases as the air supply decreases, amount of gas increases and combustion chamber space decreases; but under the most favorable conditions of air supply and firebox volume, mechanical mixing is absolutely essential if the gases are to be burned completely.

Firebox Heating Surface.

One square foot of firebox heating surface is generally supposed to be equal to from 5 to 10 square feet of flue heating surface, and often has a higher value; for firebox evaporation depends upon two variable factors,—one of which is temperature.

Firebox heating surfaces receive their heat by radiation and by convection,—the latter playing but a small part.

By "radiation", we understand that the heat travels directly from the radiating surfaces to the heating surfaces, without the aid of any material agency. That is, the heat travels by rays—just as does light—and will travel through a vacuum in the same manner as light.

By "convection" we are to understand that the heat is conveyed by means of some material agency—such as air or the gases of combustion. A dry, transparent gas will not radiate heat to any perceptible extent, nor will it receive radiant heat. The hot gases of combustion passing through the firebox and flues give up their heat only by coming in actual contact with the cooler heating surfaces. Flames, which are burning gases, do radiate heat: but the transparent gases passing through the flues do not.

The amount of heat radiated to the firebox heating surfaces depends upon the difference in temperature between the radiating surfaces and the firebox heating surfaces; and upon the area or extent of the radiating surfaces. In a locomotive firebox, these radiating surfaces consist of the grate, when covered with live coals; the luminous flames; and the hot brick-work which it may contain.

According to the well-known Stefan-Boltzmann law, a hot body—such as a fuel bed and flames—will radiate a certain amount of heat per unit of time per square foot of radiating surface: the amount so radiated being equal to a constant times the difference between the fourth powers of the temperatures of the radiating surfaces and the heat-receiving surfaces. These temperatures are absolute: that is, temperatures equal to the ordinary temperatures, as read on the Fahrenheit scale, plus 460 degrees.

By using as the temperature of the firebox sheets 460 deg. F. (or 900 deg. absolute) chart in Figure 3 has been platted to show the B. T. U.'s radiated per minute per square foot of radiating surface at different temperatures of the fuel bed, or radiating surfaces. It will be noticed that the increase in amount of heat radiated is not at all proportional to the temperature, but increases at a very much faster rate.

At an absolute temperature of 2,100 deg., each square foot of fuel bed radiates 500 B. T. U.'s per minute. Increasing this temperature to 2,500 deg. absolute, we double the amount of heat radiated. By increasing it to 3,000 deg. absolute, we get more than four times as much radiation.

It is evident from this that a small increase in firebox temperature will have a marked effect upon the amount of heat radiated and upon the evaporation; and while a reduction in the temperature of the firebox heating surfaces will also increase the amount of heat radiated, it does so to a very much smaller extent; and the opportunity for increasing the firebox evaporation by reducing the temperature of the heating surfaces is very small.

The principal means of increasing firebox evaporation is by increasing the temperature of the radiating surfaces, or by increasing their area. From this it follows that increasing firebox surfaces without increasing heat-radiating surfaces will have little effect upon the firebox evaporation.

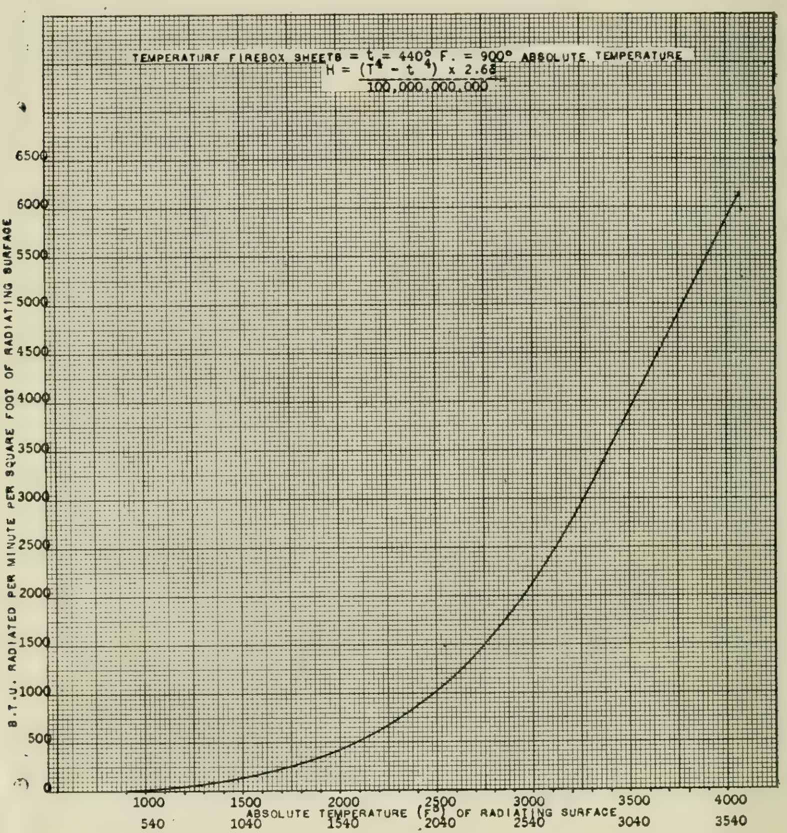


Fig. 3

The truth of this can be easily demonstrated. The candle illustrated in Figure 4 radiates heat and light equally in all directions. Suppose this flame to be inclosed by a hollow iron sphere, —all of the heat or light radiated by the flames would be taken up by the inner surface of the sphere.

Increasing the radius of the sphere will increase the area of the surfaces receiving the radiated light or heat; but there has been no change in the amount of heat or light so radiated. The surfaces of the larger sphere would receive the same amount of heat or light as the surface of the smaller sphere; but the unit of surface—such as one square inch or one square foot—of the larger sphere will receive less heat than the unit of surface of the smaller sphere.

Increasing the radius of a sphere from 1 foot to 3 feet increases the surface receiving the radiant heat nine times; that is, increase in surface varies as the square of the radius, or the

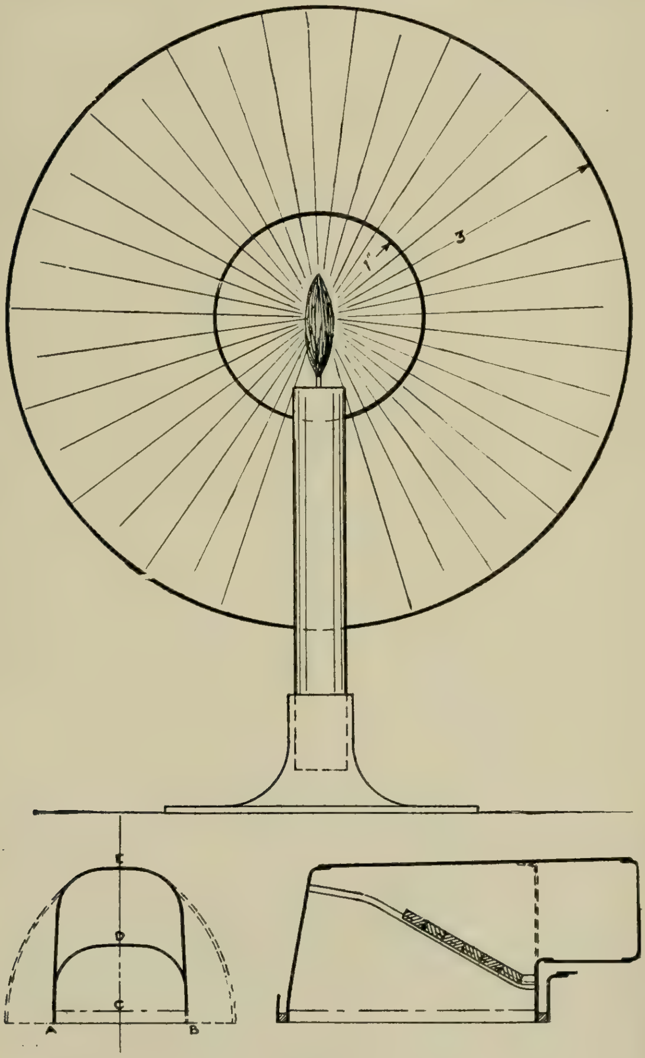


Fig. 4

distance of the surface from the source of the light: therefore it follows that while the total surface of the larger sphere receives the same amount of heat as the total surface of the smaller sphere, each square foot of the larger sphere receives only one-ninth as much heat as a square foot of surface of the smaller sphere.

The *intensity* of the heat diminishes as the distance increases; but the total amount of heat radiated remains the same. It might appear from this that by doubling the distance from the fuel bed to the crown sheet in the locomotive firebox, we would get only one-fourth as much heat per square foot of firebox heating surface—but such is not the case.

Referring to the sketch, Figure 4, where ACB represents the fuel bed, and CD the distance from the fuel bed to the crown sheet: It is evident that increasing the distance from CD to CE increases the firebox heating surface from ADB to AEB; and it is also evident that the latter is not four times as great as the former.

In this case, the evaporation per square foot of heating surface would be decreased in almost direct proportion to the increase in heating surface, if there were no changes made in the total area or temperature of the radiating surfaces.

Flame radiates heat; and it would be a logical supposition that increasing the mass of flame in the firebox would increase the amount of radiant heat given off. Such seems to be the case.

Increasing firebox heating surfaces generally increases firebox volume. This can be accomplished by increasing the depth or width of the firebox, or by adding combustion chambers. The sketches, Figure 4, clearly show that any one of these methods of increasing the heating surface will increase the volume of the firebox.

The amount of flames in a firebox will depend primarily upon the amount of combustible gas being driven off, the air supply and the volume of the firebox. If the amount of gas being burned is sufficient to fill the firebox completely with flame, the effective flame-radiating surfaces will practically equal the exposed heating surfaces of the firebox. In other words, when the firebox is completely filled with flame, the flame-radiating surfaces can be considered as an envelope or film, virtually in contact with the firebox heating surfaces at all points. If these conditions are fulfilled, it follows that the area of the flame-radiating surfaces will equal the area of the firebox heating surfaces.

As we have seen, increasing the heating surfaces increases the volume; and if this added volume is filled with flame, the increase in radiating surfaces is proportionate to the increase in heating surface. If the additional volume is not filled (or partly filled) with flame, there will be little or no increase in firebox evaporation.

Figure 5 shows the temperatures and air supply obtained in the tests under consideration. Assuming the firebox to be completely filled with flame when burning 80 or more pounds of coal per square foot of grate per hour, and was 50 per cent. filled at the low rates of combustion, Curve 3 in Figure 6 was platted,—the flame temperature being assumed to equal the observed firebox temperature. The curve showing the total equivalent evaporation from the boiler was platted from actual

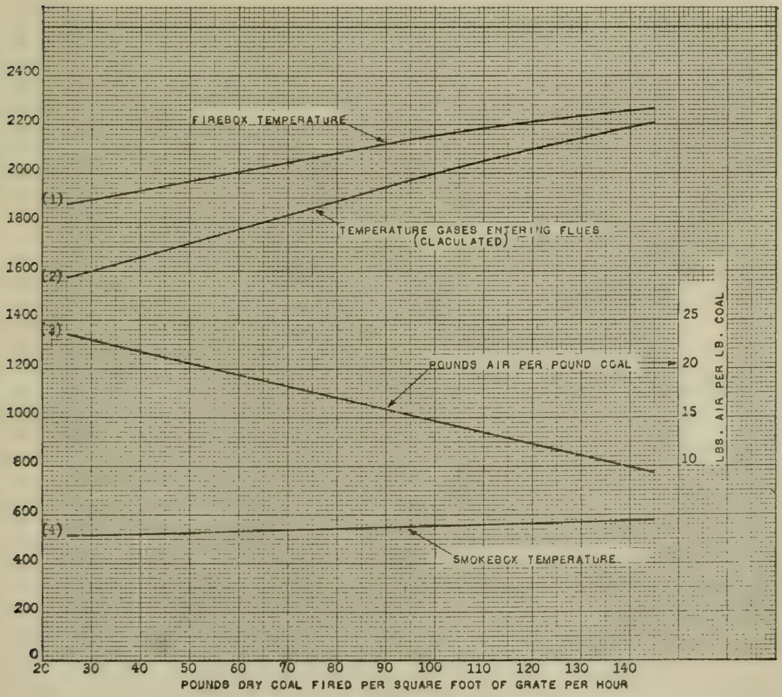


Fig. 5

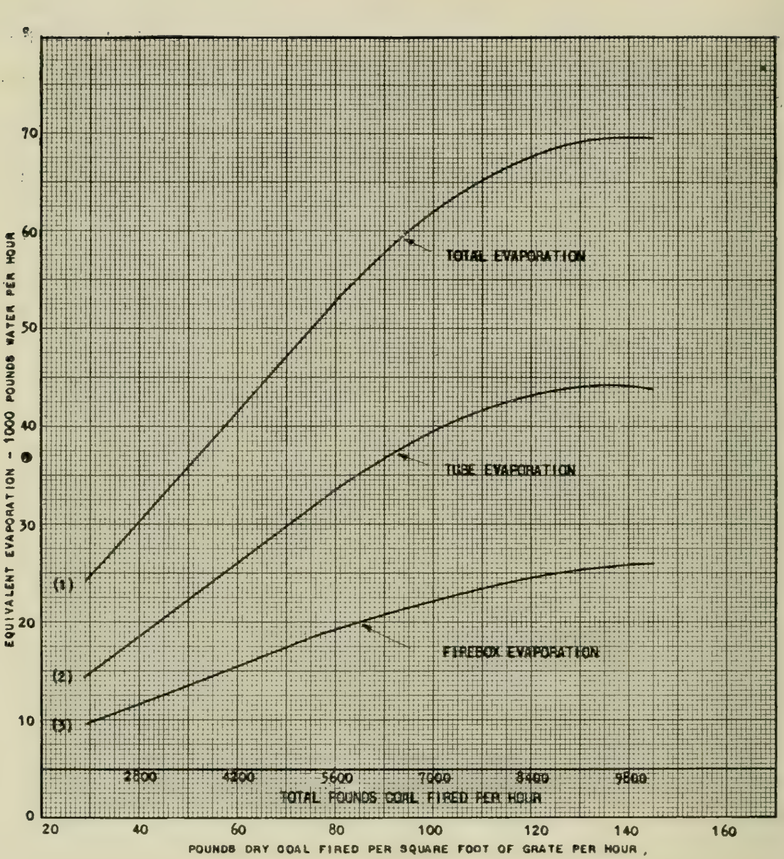


FIG. 6

EQUIVALENT EVAPORATION PER HOUR FROM
(1) ENTIRE BOILER
(2) TUBE HEATING SURFACE
(3) FIREBOX HEATING SURFACE

test data. The curve of firebox evaporation was calculated from the curve in Figure 3, using the firebox temperatures shown in Figure 5. The curve showing tube evaporation was obtained by subtracting the firebox evaporation from the total.

At the lowest rate of evaporation, the curve indicates that the firebox evaporated 40 per cent. of the total, and at the highest rate, 37 per cent. An equivalent evaporation of 24,500 pounds per hour from 232 square feet of heating surface means an evaporation of 105.6 pounds per hour per square foot of heating surface; and the temperature on the fire side of the sheet would be about 536 degrees, if the sheets were clean. These figures show what can be expected when high firebox temperatures and large radiating surfaces are to be had; for firebox evaporation depends principally upon these two factors, and only indirectly upon the extent of the firebox heating surfaces.

* * * * *

The value of a combustion chamber being admitted, what

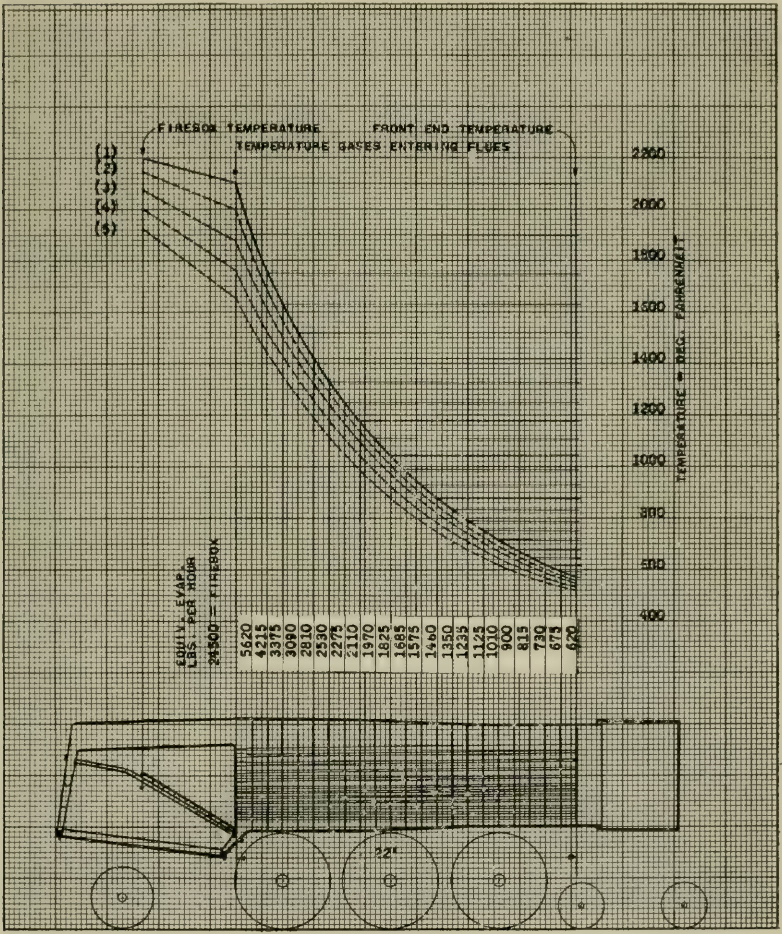


FIG. 7

CHART SHOWING TEMPERATURE DROP FROM FIREBOX TO FRONT END AT RATES OF COMBUSTION OF

(1) 120 POUNDS PER SQUARE FOOT OF GRATE PER HOUR
(2) 100 " " " " " " " "
(3) 80 " " " " " " " "
(4) 60 " " " " " " " "
(5) 40 " " " " " " " "

EVAPORATION FOR EACH ONE-FOOT SECTION OF TUBES CALCULATED FROM TEMPERATURE DROP SHOWN BY CURVE NO. 1.

of the decrease in flue evaporation brought about by reducing the flue lengths in order to incorporate a combustion chamber?

The curves in Figure 7 show the characteristic drops in temperature of the gases in passing through the flues, when burning coal at varying rates per square foot of grate per hour, with the air supply shown in Figure 5.

Suppose the flues to have been divided into twenty-two equal sections, each one foot in length and containing 240 square feet of heating surface. With a constant weight of gases passing through, the drop in temperature through each 1-foot section becomes a measure of the evaporation in that section; and the figures showing the total equivalent evaporation from each section and the equivalent evaporation per square foot of heating surface were calculated from the temperature drops and the weight of the gases,—assuming the specific heat to be constant throughout.

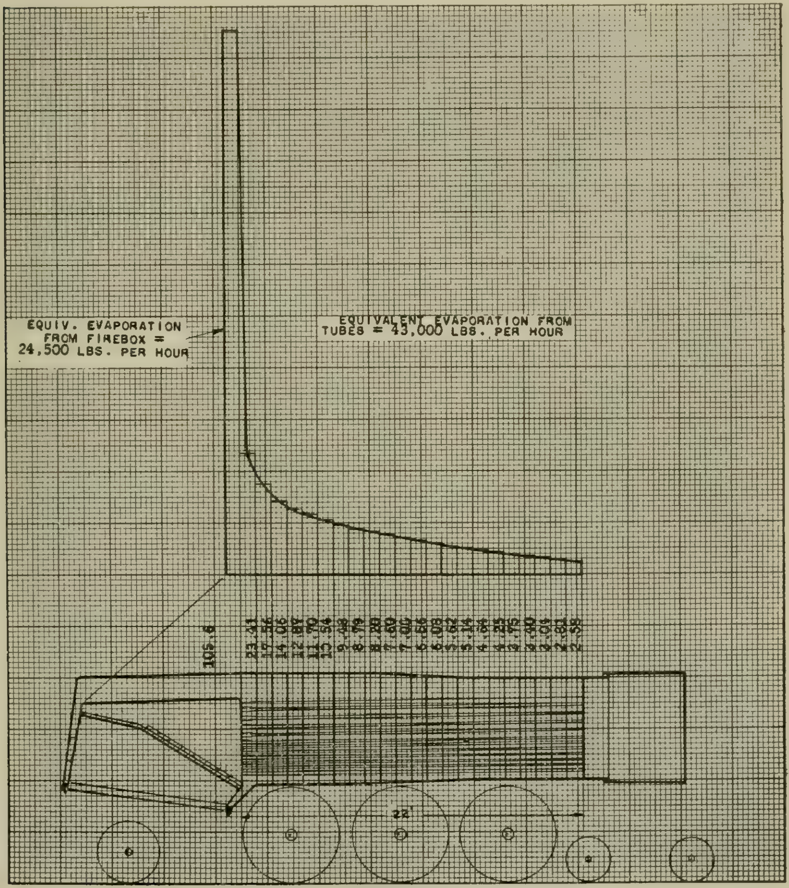
With an equivalent evaporation per square foot of firebox heating surface of 105.6 pounds per hour, the average evaporation per square foot of flue heating surface would be 8.14 pounds per hour,—this evaporation ranging from 23.4 pounds in the section next to the firebox down to 2.58 pounds per square foot in the section adjacent to the front flue sheet. It will be noted that the first four sections from the front end have a total equivalent evaporation of only 2,840 pounds per hour,—or about half that produced by the one section adjacent to the front flue sheet.

A reduction of the flue lengths to (say) 18 feet, by the application of a 4-foot combustion chamber, would reduce the flue heating surface 960 square feet; increase the firebox surface by 76 square feet, and add 108 cubic feet to the firebox volume. What effect would such a change have upon the boiler evaporation and efficiency?

As shown in Figure 2, more than 25 per cent. of the heat contained in the coal is lost through imperfect combustion, when firing at the rate of 120 pounds per square foot of grate per hour. If the additional firebox volume obtained by the use of the combustion chamber effected a saving of one-fourth of this heat loss, the resulting combustion would cause an increase in firebox evaporation of approximately 8,025 pounds, to offset the 2,840 pounds lost by shortening the flues.

This increased firebox evaporation would be obtained by the generation of heat that would otherwise have been lost, and there would be little reduction in the temperature of gases entering the flues. The front end temperature would be increased; but there would be a net increase in boiler efficiency, due to the combustion chamber, of 7½ per cent.

The relative evaporation from the firebox and flue heating surfaces is shown by the curve in Figure 8. The base of the rectangle represents the heating surface,—240 square feet for each section of the flues and 232 square feet for the firebox.



GRATE AREA = 70 SQ. FT. FIREBOX HEATING SURFACE = 232 SQ. FT.
TUBE HEATING SURFACE = 5280 SQ. FT. = 240 SQ. FT. PER ONE-FOOT SECTION.

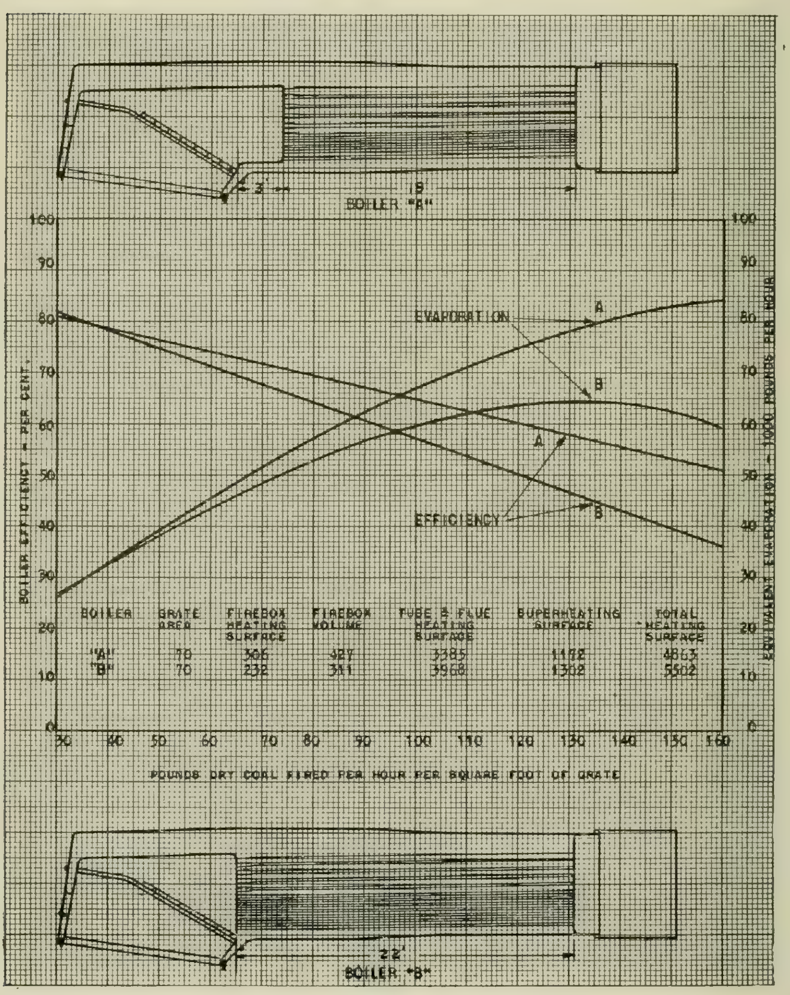
FIG. 8

CHART SHOWS EQUIVALENT EVAPORATION PER HOUR FROM FIREBOX AND FROM EACH ONE-FOOT SECTION OF TUBES, WHEN BURNING 120 POUNDS COAL PER SQUARE FOOT OF GRATE PER HOUR.

FIGURES SHOW EQUIVALENT EVAPORATION PER SQUARE FOOT OF HEATING SURFACE PER HOUR.

The height of the rectangle indicates equivalent evaporation per square foot of heating surface per hour, while the area of each rectangle represents the total evaporation per hour. The curve drawn through the top of the rectangles shows in startling form the evaporation from the firebox and combustion chamber heating surface as compared to flue heating surfaces,—particularly the forward portion of long flues.

That boiler capacity and efficiency does not depend upon



BOILER	GRATE AREA	FIREBOX HEATING SURFACE	FIREBOX VOLUME	TUBE & FLUE HEATING SURFACE	SUPERHEATING SURFACE	TOTAL HEATING SURFACE
"A"	70	306	427	3385	1172	4863
"B"	70	232	311	3968	1302	5502

FIG. 9

the mere extent of heating surface is plainly indicated by the curves in Figure 9. These boilers were alike,—except that Boiler "A" had a 3-foot combustion chamber, which was installed by making a 3-foot reduction in the flue lengths. Boiler "A" had only 4,863 square feet of heating surface, as compared with 5,502 square feet for Boiler "B"; but this decrease in heating surface, due to the installation of the combustion chamber, did not decrease the capacity or efficiency of the boiler.

Throughout the range of tests, the combustion chamber boiler had a higher efficiency and a higher capacity; and, as the rate of firing increased, the superiority of the combustion chamber boiler became more marked. At the rate of 120 pounds per square foot of grate per hour, the combustion chamber boiler had an over-all efficiency of 60 per cent., as against an over-all efficiency of 50 per cent. for the straight-firebox boiler. While this difference was not due solely to the combustion chamber, it was due entirely to furnace conditions; and serves to show the influence of the furnace upon the efficiency and capacity of the boiler as a whole.

Illustrations 10, 11, 12 and 13 show the progress that has been made in the last few years in the development of the locomotive furnace. Figure 10 shows the ordinary firebox without a baffle or mixing device of any description; Figure 11, the same type firebox equipped with a brick arch supported on water-circulating tubes, which is now standard equipment on most railroads. Figure 12 shows a combination of the arch with Gaines Wall and barrel combustion chamber, as applied to locomotive of the Mallet type; Figure 13 shows the locomotive furnace—or Gaines Combustion Chamber and SECURITY Arch—as applied to Mallet engine.

These last two cuts show the highest type of furnace design now in use in locomotive service; and while there are still some defects to be worked out and overcome, furnaces of this type are giving results in service that corroborate statements made heretofore.

The furnace shown in Figure 13 has 90 square feet of grate area, 400 square feet of firebox heating surface and an effective volume of more than 500 cubic feet,—the average length of flameway being 15 feet, and the over-all length of firebox from flue sheet to door sheet, 18 feet 3½ inches.

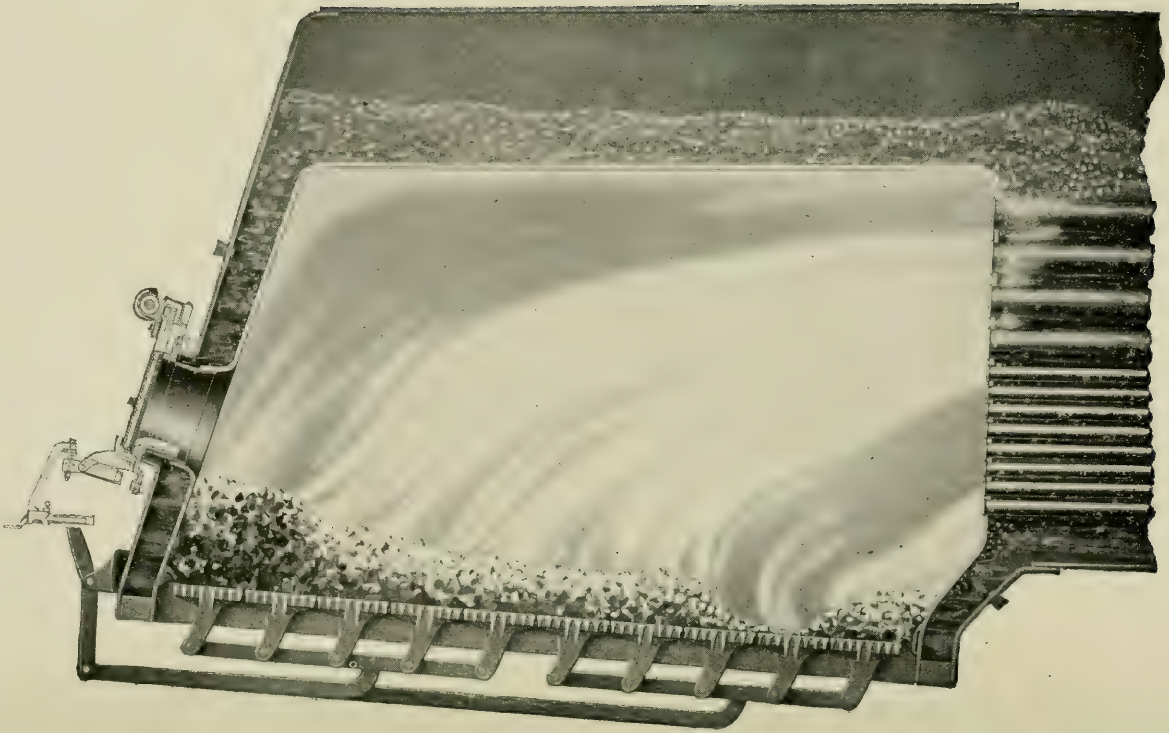


Fig. 10

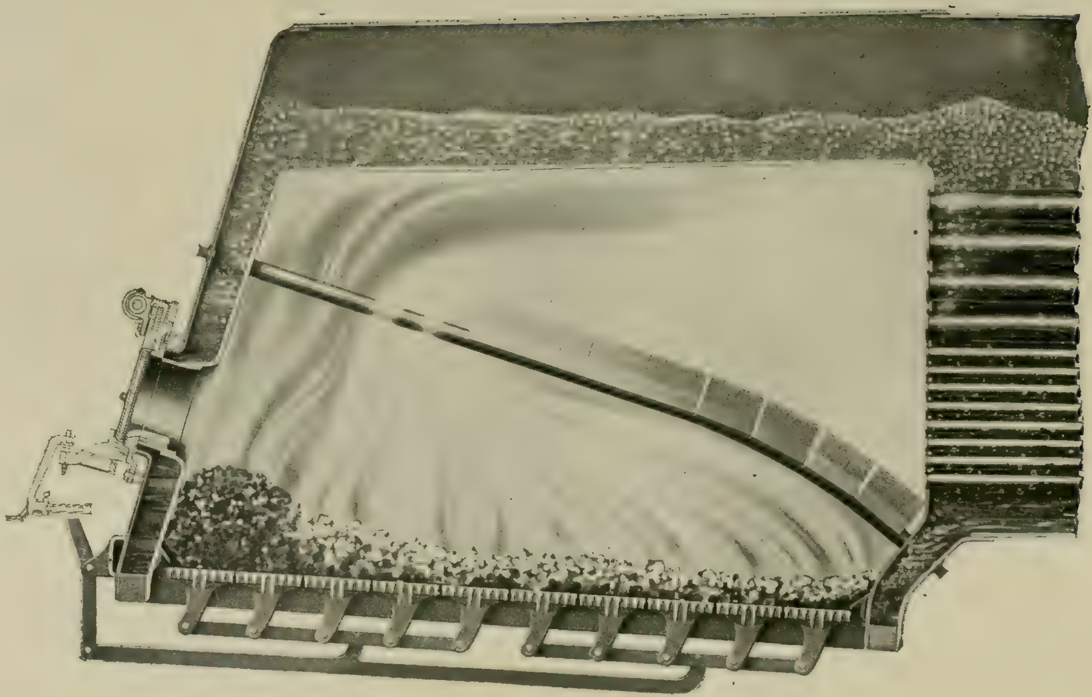


Fig. 11

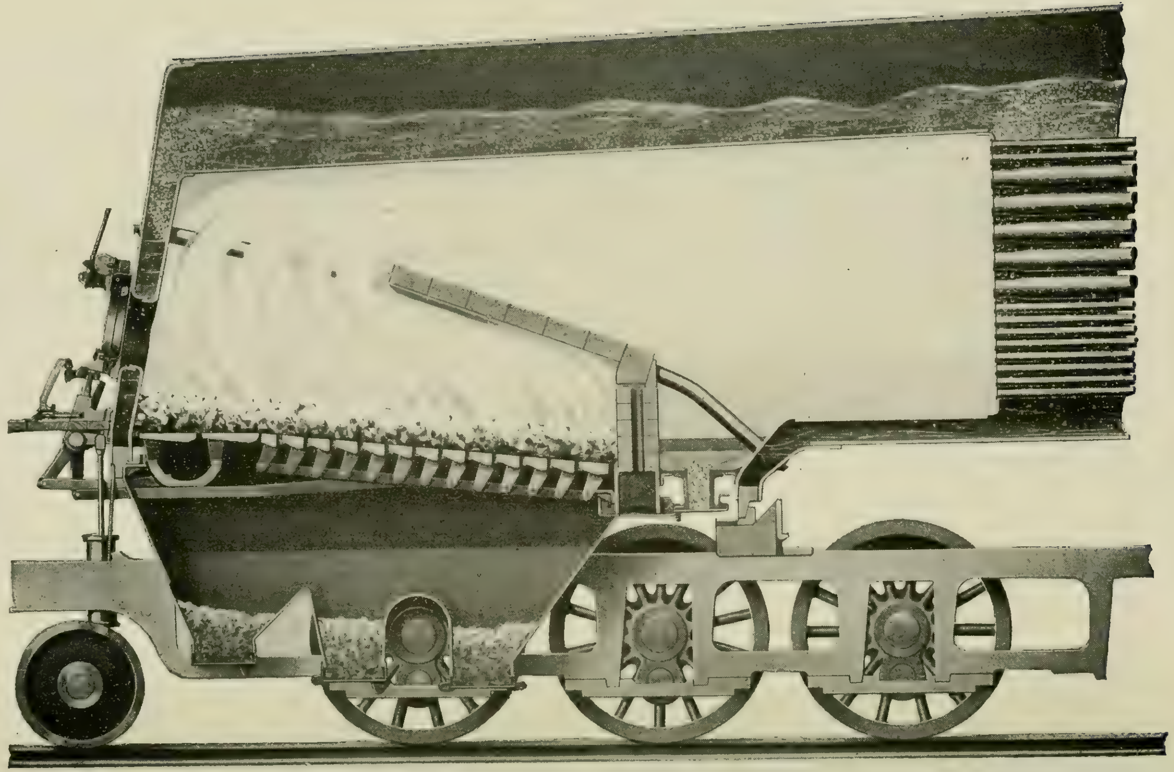


Fig. 12

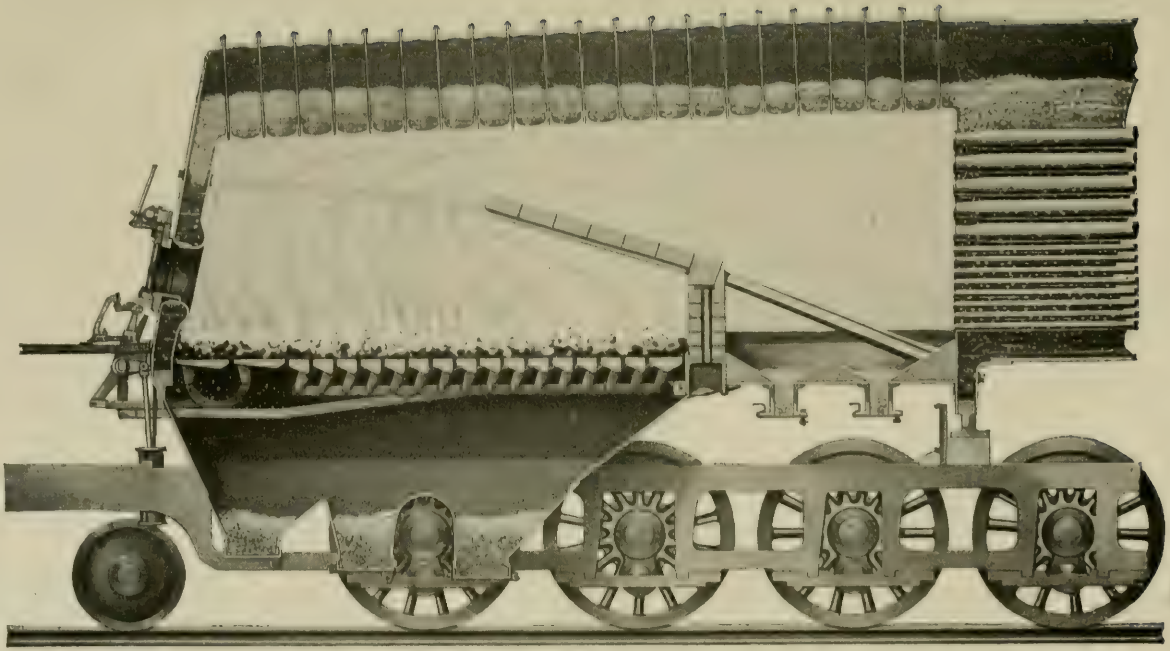


Fig. 13

A furnace of these proportions, used in conjunction with flues of moderate length, provides a boiler that is capable of being forced to high capacity without undue sacrifice in economy.

Conclusions.

Boiler capacity and efficiency is limited by the capacity and efficiency of the furnace.

Evaporative capacity depends primarily upon the generation of heat in the firebox. Long flues and large heating surface area are of secondary importance.

Furnace losses which are in large part preventable are the cause of present low boiler efficiencies.

Front end heat losses are mostly unavoidable. They can be reduced to a very small extent by lengthening flues and increasing flue heating surface.

Heating surface efficiencies are high compared with furnace efficiency; but can be increased slightly, by changing the firebox design.

Front end heat losses can be reduced by providing a furnace that will give perfect combustion with a minimum air supply.

Grate area, firebox volume or combustion chamber space, air supply and gas-mixing devices are the important factors in firebox design.

Low or moderate rates of combustion are necessary for high furnace efficiency. This can be had by increasing grate areas.

The mechanical stoker has made possible the use of larger grates.

Combustion chamber space is vitally necessary for high furnace efficiency. A large part of the heat is liberated by the burning gases above the fuel bed.

In order to burn gases, ample firebox volume, air supply and mixing of the gases are necesary.

The air supply can be reduced as the firebox volume and efficiency of the mixing increases.

Mechanical mixing of the gases is necessary. This can best be accomplished by the use of arches or bridge walls.

Locomotives with long wheel-base and trailer trucks afford excellent opportunity for the installation of large fireboxes with ample combustion chambers, without undue sacrifice of flue lengths or heating surface.

Heat generation is necessary before heat absorption can take place.

Firebox design should be the first consideration.

DISCUSSION.

PRESIDENT: The topic is in your hands for discussion now, gentlemen. I would rather you would not wait to be called upon. I am pretty certain to call on the wrong man.

PROFESSOR LOUIS E. ENDSLEY: Mr. President, I enjoyed very much this paper and I did not want to leave this room without saying something. I will have to leave in about five minutes to get a train. I want to say that the method of presenting this subject is very clear indeed.

For a great many years I have had the pleasure of analyzing the combustion in a locomotive boiler. A number of tests was conducted at Purdue University some years ago to determine a heat balance for a locomotive and I think these were the first tests ever conducted for this purpose on a locomotive. The loss that occurred along the heating surface was small as compared to those created in the fire box. The greatest loss under high rates of combustion was the cinder loss.

I want to question one point that Mr. Anthony made in regard to CO_2 or carbon dioxide being formed first and the changing back to C.O or carbon monoxide. I think the latest chemical authorities have concluded that CO is formed first and then CO_2 if enough air is present to furnish the oxygen necessary for complete combustion. Also Dixon has proven that carbon monoxide is always produced in small quantity together with carbon dioxide by the action of oxygen on carbon at a temperature of 1100° F. In any case carbon monoxide is a bad thing to have as you only get 4,350 B.T.U. out of each pound of carbon when burned to CO and 14,500 B.T.U. out of each pound of carbon when burned to CO_2. So that the thing to do is to get enough air in the fire box to burn all the carbon to CO_2, and then combustion can only take place in the fire box, for as soon as the gases enter the flues, if there was an excess of air, the temperature drops so quickly that no more combustion can take place. Thus a combustion chamber of sufficient size to completely mix the gases before they enter the flue is of advantage.

There is one other point which I did not quite understand

and that is how Mr. Anthony was able to figure 105 pounds of water per square foot of heating surface in the fire box. I think he is familiar with Professor Goss' tests in which the maximum evaporation was about 55 pounds per square foot of fire box area. I understand the figures given by Mr. Anthony were calculations and not tests. Were they not?

MR. ANTHONY: Yes, they were calculations.

PROFESSOR ENDSLEY: I am absolutely confident that good combustion in the fire box will increase the efficiency of the locomotive. As Mr. Anthony has brought out that the time that it takes the gases to pass through the fire box is only 1/7 of a second. If this time could be increased by having a longer fire box or combustion chamber, to only ⅕ of a second, it would increase the time of combustion almost 50%, and while the increase in time is very small, the increase in per cent is large. I personally would much rather have a 19-foot flue with a 3-foot combustion chamber than a 22-foot flue and no combustion chamber. I feel without a doubt that the use of some form of combustion chamber to increase the size of the fire box is going to be used more and more as we appreciate its value.

PRESIDENT: Any other comment or inquiry? I hope the young men will not pass up the opportunity to ask questions to bring out any further information on which you are not clear.

MR. D. J. REDDING, P. & L. E. R. R.: Mr. Chairman, I would like to ask the speaker a question. Of course, we are all agreed with him that a long fire box is a good thing, combined with the combustion chamber and I know of no better scheme that has been worked out so far than the one which has been shown here, the Gaines fire wall and combustion chamber.

I would like to ask whether much of the late power that is being built is equipped with this style fire box, and whether they have worked out any better provision for taking care of the spark hoppers than in the case of those which I have seen and which were a constant source of annoyance and engine failures on account of not being built substantially enough to keep them tight, permitting air to enter the combustion chamber which caused the formation of large masses of cinders there. In other words, whether there has been any improvement in the mechanical details. The theory of the fire box which he showed there last, I think, is no doubt correct, and there isn't any question but that in the past there has been entirely too much attention paid to getting long boiler tubes at the sacrifice of flame space, but unfortunately perhaps, the fire boxes of this type which I have seen, have so many mechanical defects they give the scheme a black eye, though I may say the engines I refer to were not owned by our Company, but borrowed during a shortage of power.

PRESIDENT: If you have no other discussion or questions to ask, we will ask Mr. Anthony to close the discussion.

MR. ANTHONY: As to the question raised by Professor Endsley in regard to the production of CO_2 and carbon monoxide I think he is wrong.

The carbon dioxide is formed when the air comes through the grates and strikes the heated coals. You get complete combustion right on your grate and the carbon dioxide formed goes up through your fuel bed and is reduced to CO. That is one of the methods used in gas plants for making gas, and I think that the government laboratories, have made a lot of tests along these lines determining just what temperatures and just what fuel bed thicknesses would give certain percentages of reduction of CO_2 into CO. That is a question that has been discussed by engineers and chemists for some years without any final and definite conclusion, but I trail with those who believe and who seem to have reason for believing that the CO_2 is reduced to CO.

I agree with Professor Endsley that the formation of CO is a bad thing,—but it is a condition and not a theory that confronts us. CO is formed in large quantities in the locomotive fuel bed; and it is necessary to make provisions, such as large combustion chambers and secondary air supply, to burn this CO completely in the firebox before it reaches the flues.

As to the evaporation. I gave an evaporation figure of 105.6 pounds per square foot of fire box heating surface. You will remember that this was *equivalent* evaporation and that means, under the conditions, an actual evaporation of a little more than 85 pounds.

I witnessed a number of the tests he referred to and am familiar with the conditions. The fact that they got 55 pounds evaporation per square foot of fire box heating surface is absolutely no reason, as I see it, why you cannot get more, because the evaporation depends on the temperature and the extent of your radiating surfaces. As you increase the temperatures, or as you increase the mass of flame or the extent of the radiating surfaces, you are going to increase the evaporation. An evaporation of 55 pounds is not necessarily representative of present day fire boxes. In many respects these tests are out of date; and cannot be accepted as conclusive.

In regard to the spark hoppers. We have sixteen road men in our service department whose business it is to follow these things and see that they give service, and 99% of the reports we have gotten say that open hoppers were the cause of the trouble. Now, these hoppers are made with a spring and a latch so that when they are closed they will stay closed, but if you run an engine out and leave them open, why, we haven't any safeguard against that. I do not mean to insinuate that this is what happened in Mr. Redding's case, but I do say that it is what happened in most of the cases that have come to our attention. It has been largely a question of neglect on the part of the clinker pit men in opening them and failing to shut them. I admit there are some defects which we have been unable to correct. We haven't got a hopper that is absolutely fool proof. Mr. Neff, I think, has a few gray hairs from trying to get one. He is working on one now, but is afraid to put it in use. I will let Mr. Neff speak for himself.

MR. JOHN P. NEFF: The hopper that we are working on is one that would automatically close itself if the clinker pit man left it open, and it has been suggested that we make it large enough so when a man wanted to go up through this hopper to work on the flues he could do so without going through the fire box, but if this hopper is made so that it will automatically close, it might close up while the man was up inside and be difficult to open from inside. That is the reason I am a little fearful of using it.

MR. H. B. KELLY, P. & L. E. R. R.: Mr. Anthony, I have had some experience with those combustion chambers in some of the borrowed engines we have had in the last fifteen months. I got into the fire box myself before they left and saw that they were perfectly clean, and the engine failed in steam within about fifteen miles. That happened to me two different times and the hopper was closed and did not come open. What caused the engine to fail? She was getting air and also the combustion chamber filled with dirt. I have known the combustion chamber to fill up within fifty miles, fill up to a height of twelve inches, which would form a cinder that you would have to get in there with a pick and dig out. I have been in the fire box on three or four different occasions myself when the engine came in the round house. I have found them a couple of times getting air between the slide and the hopper. I have never found the hoppers open. Our greatest trouble has been that they filled up with dirt and cinders. I know positively on three different occasions that the combustion chamber was perfectly clean when the engine started out and the engine failed for steam.

MR. ANTHONY: Was that a hand fired or stoker fired, may I ask you?

MR. KELLY: Hand fired.

MR. ANTHONY: That merely illustrates the difference in conditions. Some roads have even gone to the extent of sealing those hoppers up and say that they did not need them. They thought that the hopper on a combustion chamber was superfluous because they did not need it at all. This merely illustrates the difference in operating conditions that confronts you on different roads. I admit we have had trouble with that hopper. We used to have a cast iron cap and we tried to get away from that and use a sheet iron. We also had trouble with air leaking between the mud ring and the combustion chamber floor plate. We tried to make that tight by using a gasket—an asbestos gasket—but we found it would not stand the temperatures and on recent orders we have been welding the floor plate all the way around on the inside, and we intend to do that on all future installations.

I don't know whether we can work out a successful and fool proof hopper or not, but we will continue to try.

MR. KELLY: Does Mr. Anthony know that when cleaning your fire on the ash pit you open your hopper and shove your rod up in there you get some of the cinders but the cinders that lie back to the side you don't get. You cannot clean out thoroughly by opening up your hopper and using a rod; you get what lies over the hopper and that is all.

MR. ANTHONY: I have heard of this trouble in a few cases. I would appreciate any further criticism from those who have had experience with these engines. We are looking for light. We know that there are some defects in this combustion chamber and we want to improve them. Of course, our men are around following these things up, but they don't find out all the defects, and it is only as you bring them to our attention that we can make improvements on them. We will be glad to hear from anybody who has had trouble with their engines so equipped.

MR. KELLY: I would like to ask Mr. Anthony whether he ever heard of any particular difficulty in getting these engines heated in the round house where you only had the stack blower to work with. They are good steamers but we find they are very hard to get started in the round house with the ordinary blower.

MR. ANTHONY: I would think it would take a little longer to get one of them heated up on account of the additional fire box volume and the additional brick work.

MR. KELLY: We had some trouble in getting these engines heated in the round house and I wanted to try it out myself, and it took me one hour and fifteen minutes from the time we put the fire in the engine until we got enough steam to back the engine out of the round house. I think it was an hour and fifteen minutes it took us as compared with about thirty-five minutes with the other engines not equipped with the combustion chamber.

MR. ANTHONY: Did you have the air ducts in the wall open or shut?

MR. KELLY: Well, now, I don't remember whether we did or not.

MR. ANTHONY: We have experienced some trouble on that score. There are some complaints that the secondary air supply neutralizes the air coming through the grates, and of course it does to a certain extent. They claimed they could get up steam quicker by plugging the holes in the wall.

MR. KELLY: Suppose they forgot to take the plugs out.

MR. ANTHONY: Some of them have.

PROFESSOR ENDSLEY: (Contributed after close of meeting) In answer to Mr. Anthony's closing remarks I will quote from Roscoe & Schorlemmer* "Treatise on Chemistry," in which they make the following statement:

"It is not yet known with certainty whether the first product of the oxidation of carbon is the monoxide or the dioxide. It was formerly supposed that carbon dioxide is always produced to begin with, and that when insufficient oxygen is present some of the carbon dioxide is acted upon by the remaining carbon with formation of the monoxide. It is, however, equally possible that the first product of the oxidation is always carbon monoxide, and that if excess of oxygen be present, this then combines with the monoxide yielding carbon dioxide. Whilst no definite experimental proof has yet been found, the work of recent investigators and especially of Dixon and H. B. Baker, has yielded results which are more readily explained according to the second of these views than the first.

"Dixon has shown that, contrary to the statement of Lang, carbon monoxide is always produced in small quantity together with the dioxide by the action of oxygen on carbon at 500°C, although the dioxide is not reduced to the monoxide by carbon below a temperature of 600°C, and it is difficult to explain the presence of carbon monoxide unless it is the primary product of oxidation. Baker has further proved that thoroughly dried carbon and oxygen only combine very slowly when strongly heated, and the chief product is then the monoxide, whilst dry carbon monoxide is not reduced to dry carbon at a bright red heat. These results also appear to indicate that the monoxide is first formed, and afford further evidence of the effect of traces of moisture in bringing about the combination of carbon monoxide and oxygen. The researches of Dixon and his pupils on the explosion of gases likewise lead to the same conclusion; thus, for example, when cyanogen gas is exploded with only a sufficient quantity of oxygen to yield carbon monoxide and nitrogen, the velocity of the explosion wave is much higher than when sufficient oxygen is present for the formation of carbon dioxide. This result is readily understood if carbon monoxide is first formed in both cases, and then undergoes a second reaction before it yields the dioxide." . . .

---

*Non Metallic Elements. Mechanism of Combustion of Carbon. Page 810.

I think the above is probably as good an authority on combustion as any one today, so there is, at least, a chance of a difference in opinion between Mr. Anthony and myself.

Also in answer to Mr. Anthony's statements that the work done by Dean Goss was conducted on a boiler which was entirely out of date, I will say that the boiler on which these tests were conducted was a boiler having 58 square feet of grate area and over 200 square feet of fire box area with approximately 3,000 square feet of heating surface. The tests were conducted on a modern radial stay boiler, a Jacob Shupert of approximately the same size. They were conducted in 1912 at Coatesville, Pa. A summary is given in the Railway Age Gazette of February, 1913. In this summary the maximum evaporated by any fire box was 51.29 square feet of fire box, so I do not believe that Mr. Anthony's statement that it was on an old-time and out of date boiler is borne out.

MR. ANTHONY: Answering Professor Endsley's contributed remarks:

He has quoted at length from one authority, in support of his theory that CO is first formed, and is not due to the reduction of CO_2. It would be possible to quote just as eminent authorities in support of the other view,—that CO_2 is first formed and is then reduced to CO.

This authority states that the dioxide is not reduced to the monoxide by carbon below a temperature of 600° Centigrade. Assuming this to be true, it has no direct bearing on the question; as a temperature as low as 600° Centigrade (or 1100° F.) is seldom, if ever, obtained in a firebox under working conditions.

With a fair grade of high volatile coal, our firebox temperatures range from 2,000 to 2,800 degrees F., and the fuel bed is at white heat, even down to the grates. I have often seen the grates red-hot. Taking into consideration the thickness of fuel bed carried on a locomotive grate, the high velocity of the inrushing air and the temperatures obtained, the formation of carbon monoxide by the reduction of carbon dioxide is not at all impossible.

Regardless of the method of formation of carbon monoxide, tests indicate that a large percentage of the gases leaving the fuel bed is carbon monoxide; and the question in which we are interested is,—how can this carbon monoxide be completely burned before reaching the flue sheet?

Referring to the dimensions given for the boiler used in the Coatesville tests: While there are many thousands of locomotive boilers in service of this size (and even smaller sizes today, the tendency is towards larger boilers, with larger grates and larger heating surfaces than those shown; and such a boiler would hardly be considered representative of present-day practice.

As I attempted to show, firebox evaporation is a function of the temperature and extent of the radiating surfaces in the firebox. These will vary not only with the quality of coal used, but with the grate area, air supply, combustion chamber space and efficiency of the gas-mixing device employed. With such a number of variables entering into the question, I fail to see the logic of concluding that a square foot of firebox heating surface will evaporate 55 pounds of water,—for a change in any of these conditions will change the evaporation, which might as readily be 45, 65 or 85 pounds per square foot of heating surface.

As stated, the total evaporation from this boiler was platted from actual test data; firebox evaporation was calculated, and the tube evaporation arrived at by subtracting the firebox evaporation from the total.

If the firebox evaporation shown is too high, it follows that the tube evaporation is too low. Curve 2 in Figure 5 shows the calculated temperature of the gases entering the flues. It was necessary, with the air supply shown, to have that temperature of gases entering the flues, in order to get the tube evaporation shown. If the tube evaporation is too low, then the temperature of the gases is too low,—and a comparison of the gas temperature with the firebox temperature does not point to suh a condition.

The firebox temperatures were taken at a point just at the rear of the arch, where the combustion is most rapid and temperatures are probably at the maximum; and it is logical to suppose that there will be a drop in the temperature between this point and the flue sheet, as the burning gases are radiating heat to the firebox surfaces as they pass over the arch to the flue sheet.

We do not believe that the assumptions made are illogical or unwarranted—neither have we any reason for doubting the test data which was used as a basis in making the several calculations. In spite of the research work done in the past, the differences of opinion divulged here show a lack of conclusive and authoritative data on the subject of the generation and utilization of heat, and indicate the need of continued activity along this line.

MR. REDDING: Mr. President, as there seems to be no further interrogation or discussion, I want to move that we offer a vote of thanks to Mr. Anthony for his very interesting paper. It is one of those papers in which you do not grasp all the significance of the figures as you hear them told, or read, but it will be valuable in the printed Proceedings because it is a paper that requires study and it takes time for an ordinary man to get any value out of the figures shown on the charts. I think this paper will be one of the classics of this organization. I move that we give Mr. Anthony a vote of thanks.

Motion unanimously agreed to.

No further business, Meeting Adjourned.

J. B. Anderson
Secretary.

RAILWAY CLUB NOTES.

The following subjects were presented and discussed by the several Railway Clubs during the month of February, 1917, as noted below:

New York Railroad Club, Harry D. Vought, Secretary,
95 Liberty Street, New York, N. Y.

SUBJECT—"The Locomotive Furnace" by J. T. Anthony.

New England Railroad Club, Wm. E. Cade, Jr., Secretary,
683 Atlantic Avenue, Boston, Mass.

SUBJECT—"Review of Steam Railway Electrification" by W. R. Stinemetz.

Canadian Railway Club, Jas. Powell, Secretary,
P. O. Box 7, St. Lambert, near Montreal, Can.

SUBJECT—"The Chilled Iron Car Wheel" by George W. Lyndon.

Richmond Railway Club, F. O. Robinson, Sec'y, Richmond, Va.

SUBJECT—"The Valuation of Common Carriers" by James P. Nelson.

St. Louis Railway Club, B. W. Frauenthal, Secretary,
Union Station, St. Louis, Mo.

SUBJECT—"The Locomotive Inspection Laws and Rules," by Frank McManamy.

Southern & South Western Ry. Club, A. J. Merrill, Secretary,
Box 1205, Atlanta, Ga.

SUBJECT—Unknown.

Central Railway Club Buffalo, N. Y., Harry D. Vought,
Secretary, 95 Liberty Street, New York, N. Y.

SUBJECT—(No meeting).

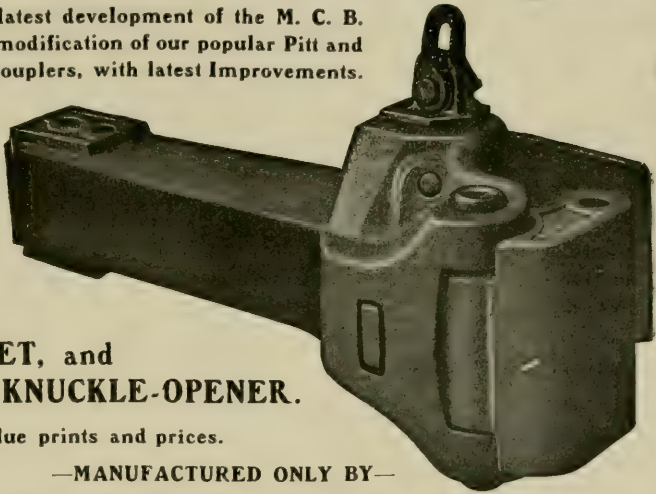
The Railway Club of Pittsburgh, J. B. Anderson, Secretary,
207 Penna. Station, Pittsburgh, Pa.

SUBJECT—"The Effect of Fire Box Design Upon Boiler Capacity and Economy by Mr. J. T. Anthony.

Copies of the above papers can be had upon application to the Secretary at the address given for a nominal price.

THE PENN COUPLER

Our latest development of the M. C. B. Coupler, a modification of our popular Pitt and Janney X Couplers, with latest Improvements.



LOCK-TO-THE-LOCK,

LOCK-SET, and KNUCKLE-OPENER.

Send for blue prints and prices.

—MANUFACTURED ONLY BY—

THE McCONWAY & TORLEY CO.,
PITTSBURGH, PA.

This Space For Sale

PINTSCH MANTLE LIGHT

The system that has made good wherever it has been applied . . . .

SAFETY ELECTRIC LIGHT

Type "F" regulation ensures constant lamp voltage and long lamp life .

The Safety Car Heating & Lighting Co.

Chicago, Philadelphia, Washington, Boston,
St. Louis, San Francisco, Montreal

2 Rector St., New York

KING

METALLIC PACKINGS

for Locomotive Piston Rods, Valve Stems & Air Pumps

SECURITY WRIST PIN
LEACH SANDERS
GOLLMAR BELL RINGER
INDESTRUCTIBLE OIL CUP
BRAIDED SWAB, ETC.

The U. S. Metallic Packing Co.
PHILADELPHIA

FIREBOX FACTS

1. Big locomotives have long wheel bases.
2. Long wheel bases must be covered by long boilers.
3. Long boilers mean excessive flue lengths.
4. Excessive flue lengths represent investment in heating surfaces of low evaporative values.
5. Shorter flues mean longer fire boxes.
6. Longer fire boxes (with combustion chambers) of the radial stay type are dangerous and introduce added stay bolt troubles.
7. The Jacobs-Shupert sectional fire box (and combustion chamber when required) supplies the means for designing locomotive boilers of correct economic proportions and at the same time for reducing maintenance problems to a minimum.

"YOURS FOR BETTER BOILERS"

Jacobs-Shupert U. S. Firebox Co.

30 Church St., New York. Works: Coatesville, Pa.

RAILWAY STEEL-SPRING COMPANY,

Springs,

Steel Tired Wheels,

Locomotive and Car Wheel Tires.

GENERAL OFFICE, 30 CHURCH STREET, NEW YORK

BRANCH OFFICES:—CHICAGO, ST. LOUIS, ST. PAUL, WASHINGTON, D. C.

Hundreds of G-E Planer Drives are in Successful Operation

The first G-E Planer Drive, built five years ago, and hundreds built since then are in use throughout this country. Repeat orders constantly testify to their splendid operating records.

Carefully consider the following advantages of this equipment:

Vastly more economical in operation and upkeep than any other existing drive.

Maximum cutting speed always sustained, giving greatly increased production.

Reverses remarkably close to a line.

Standard motor speeds 250—1000 r.p.m.

Many speed combinations, allowing slowest cutting and highest return speed to be combined.

Freedom from shocks, giving quickest reversals possible without jar.

Unexpected return of current to wires always finds motor and control apparatus ready to receive it.

Quiet operation.

Sparkless commutation.

Trouble proof control in easy reach of operator.

This equipment is conservatively rated and has ample power. Investigate the power rating of the motor you buy.

General Electric Company

GENERAL OFFICE
SCHENECTADY, NEW YORK

District Offices in

Boston, Mass.	New York, N. Y.	Denver, Colo.
Cincinnati, Ohio	Chicago, Ill.	Atlanta, Ga.
St. Louis, Mo.	Philadelphia, Pa.	San Francisco, Cal.

Sales Offices in all Large Cities 6545

STANDARD STEEL CAR COMPANY

OFFICES { General Offices: Frick Bldg., PITTSBURGH, PA.
NEW YORK: 170 Broadway
CHICAGO: Fisher Building

WORKS { BUTLER, PA.
NEW CASTLE, PA.
HAMMOND, IND.

STEEL AND COMPOSITE

FREIGHT CARS

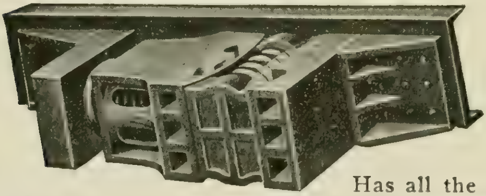
For all Classes of Service, from our Standard Designs,
or according to Specifications of Purchasers.

Steel Car Underframes

TRUCKS, BOLSTERS, BRAKE BEAMS, ETC.

Capacity 50,000 Cars per Annum

INQUIRIES SOLICITED



USE BUTLER DRAFT GEARS

FRICTION RIGGING

PIPER PATENTS

200,000 lbs. Capacity.

Has all the points of a Perfect Gear.

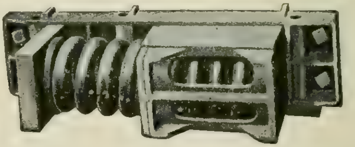
TANDEM SPRING ATTACHMENTS

6¼x8 or 8x8 DRAFT SPRINGS

PERFECT SPRING PROTECTION

Butler Drawbar Attachment Co.

Send for Catalog CLEVELAND, OHIO



SCHAEFER

DROP-FORGED

FOUNDATION BRAKE GEAR DETAILS,

COMBINE

MORE STRENGTH WITH LESS WEIGHT

Schaefer Equipment Company

Oliver Building Pittsburgh, Pa.

STANDARD STEEL PLATFORMS

ARE IN USE BY 281 COMPANIES

SESSIONS—STANDARD FRICTION DRAFT GEARS

ARE IN USE BY 205 COMPANIES

—BOTH MADE BY—

THE STANDARD COUPLER CO.

CHICAGO: People's Gas Building NEW YORK: 30 Church St.

J-M RAILROAD SUPPLIES

- Roofings
- Packings
- Gaskets
- Pipe Coverings
- Hair Felt
- Smoke Jacks
- Asbestos Wood
- Waterproofing
- Cork
- Fibre Conduit
- Locomotive Lagging
- Flexible Armored Squirt, Tank, Car Heating, Air Brake and Air Signal Hose
- Air Brake Expander Ring
- Steel Car Insulation
- Underground Conduit
- Asbestos Cements
- Brake Lining and Blocks
- Electrical Supplies
- Mastic Flooring
- Speedometers
- Fire Extinguishers
- Manual Slack Take Up for Air Brakes
- Vitribestos Stack Lining
- Refrigerator Car Insulation

Write for Catalogs

H. W. JOHNS-MANVILLE COMPANY

New York and Every Large City

Union Steel Casting Company,

PITTSBURGH, PA.

Steel Cast Locomotive Frames, Driving Wheel Centers, and Miscellaneous Locomotive Castings.

Vanadium Steel Castings a Specialty

Standard Heat & Ventilation Co. Inc.

Heating Apparatus for Railway Cars and Locomotives

Car Ventilators, Storage Battery Charging. Plugs and Car Receptacles.

165 Broadway **New York**

Freight and Passenger

CARS

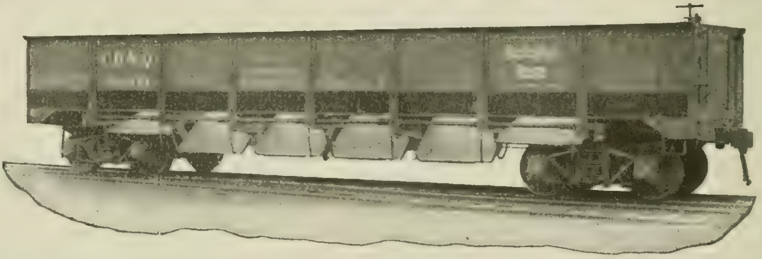
Of Every Description

Pressed Steel Specialties

Tank Cars Mine Cars

Pressed Steel Car Company

New York Pittsburgh Chicago St. Paul



FOR

GREATER EFFICIENCY

USE

DAVIS **SOLID-TRUSS** BRAKE BEAMS

FOR

Freight and Passenger Equipment.

ALSO

Pressed Steel Journal Box Lids.

DAVIS BRAKE BEAM CO.,

JOHNSTOWN, PA.

FRANK J. LANAHAN, Pres. CHAS. J. GRAHAM, Vice-Pres. H. L. REPLOGLE, Gen'l. Sales Rep

STUCKI
Side Bearings
SAVE WHEELS, RAILS, POWER
AVOID DERAILMENTS

A. Stucki Co.
Oliver Building
PITTSBURGH,
PA.

This Space For Sale

This Space For Sale

SUYDAM'S Protective PAINTS
For Freight Cars and Structural Steel Work
—MANUFACTURED BY—
M. B. SUYDAM COMPANY,
OFFICE AND WORKS, 61ST AND BUTLER STS.,
BELL 'PHONE, 343 FISK. PITTSBURGH, PA.

This Space For Sale.

FOR SALE

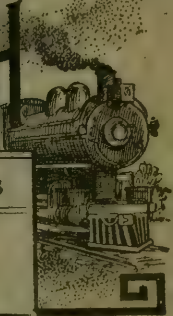
BRADY BRASS CO.
MANUFACTURERS OF
CYPRUS BRONZE FOR LOCOMOTIVE and CAR BEARING USE
ENGINE CASTINGS BABBITT METALS
JOURNAL BEARINGS MOTOR BEARINGS
General Office and Works, 170-182 Fourteenth St. and 169-175 Fifteenth St., Jersey City, N. J.
DANIEL M. BRADY, President

TYPE A SUPERHEATER LOCOMOTIVES
Make firing easier
Haul longer trains
Save coal and water
Maintain faster schedules
LOCOMOTIVE SUPERHEATER COMPANY
30 Church St., New York. Peoples Gas Bldg., Chicago.

OFFICIAL PROCEEDINGS

RAILWAY CLUB OF PITTSBURGH

$1.00 Per Year 20¢ Per Copy



Vol. XVI. MARCH 23, 1917 No. 5

"RED CROSS ORGANIZATION"
"REPORT ON REVISION OF M. C. B. RULES"
"THE TELAUTOGRAPH"
"WHAT IS LAW"

BOLTS NUTS RIVETS
STEEL CAR FORGE COMPANY
"FORGING SPECIALISTS"
PITTSBURGH NEW YORK CHICAGO

FOR SALE

Electrical Uses
ARISTOS
"COPPERWELD"
Mechanical Uses
A COPPER CLAD STEEL WIRE
Product of the COPPER CLAD STEEL CO., Pittsburgh, Pa.
Drawn and Sold Exclusively by
PAGE WOVEN WIRE FENCE CO., - - Monessen, Pa.

FOR SALE

TORCHES

Gem Torches Save You Money

Exhaustive tests by largest railway systems have proven that Gem Brazed Seam Torches do save money. Let us prove it. Send for free sample and information.

Gem Manufacturing Company
PITTSBURGH, PA.

Graham Nut Company
PITTSBURGH, PA.

MANUFACTURERS OF

Hot Pressed Nuts, Cold Punched C. & T. Nuts
Bolts, Lag Screws, Washers, Etc

This Space For Sale

JOHNSON

"They Resist Friction"

Compare Your Costs With Our Quotation

Are you paying too much for your car and locomotive bearings?

We believe we can make them for you at a lower figure, and any bearing furnished by this company is the last word in friction-resisting qualities.

We have the facilities of five railroads to assist in quick handling of large orders and an average life time of specialized experience is put into the quality of our product.

Send Dept. R. C. your blue prints and specifications and compare our quotation with your costs.

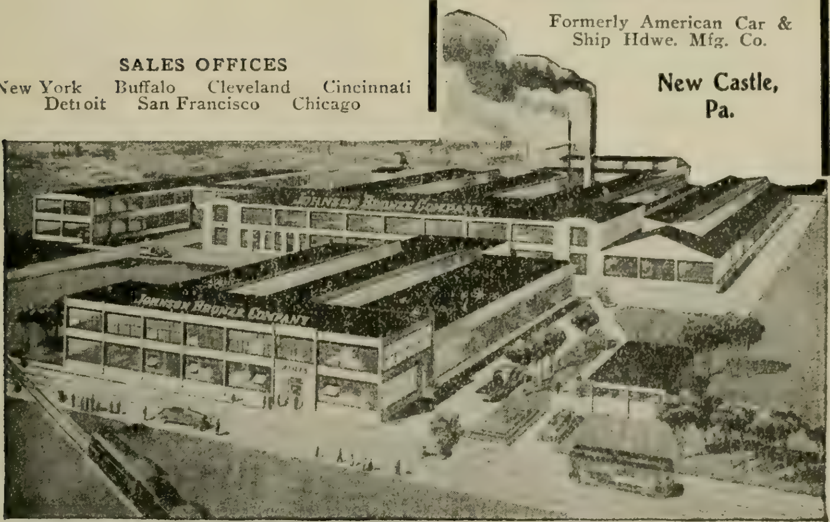
BUSHINGS

JOHNSON BRONZE COMPANY

Formerly American Car &
Ship Hdwe. Mfg. Co.

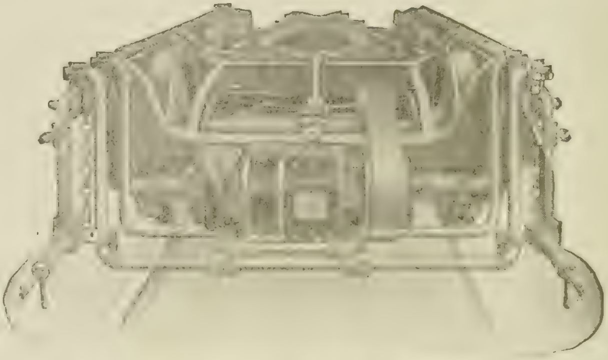
**New Castle,
Pa.**

SALES OFFICES
New York Buffalo Cleveland Cincinnati
Detroit San Francisco Chicago



THE GOULD "SIMPLEX" SYSTEM OF

ELECTRIC CAR LIGHTING

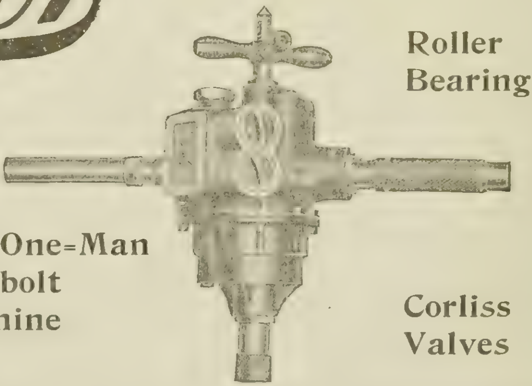


GOULD COUPLER CO.

NEW YORK

Thor

Roller-Bearing Compound
Piston Air Drills



Roller
Bearings

No. 32
L

The One=Man
Staybolt
Machine

Corliss
Valves

FURNISHED ON TRIAL FREE. WRITE NEAREST BRANCH

INDEPENDENT PNEUMATIC TOOL COMPANY

Chicago : New York : Pittsburgh : Detroit : San Francisco : Birmingham : Montreal, Que.

MANNING, MAXWELL & MOORE,

ROBT. A. BOLE, MANAGER, PITTSBURGH BRANCH

PARK BUILDING

LONG DISTANCE TELEPHONE CALL. GRANT 67

Railway and Machinists' Tools and Supplies, Electric Traveling Cranes, Compressors, Pneumatic Hoists, Riveters and complete Machine Shop and Foundry Equipment

NATIONAL CAR WHEEL COMPANY

MANUFACTURERS OF

"STAR SPECIAL"

Reg. U. S. Patt. Off.

CHILLED CAST IRON CAR WHEELS

WORKS:
Rochester, N. Y. Pittsburgh, Pa.
Sayre, Pa. Cleveland, O.
New York City, N. Y.

General Offices:
PITTSBURGH, PA
New York Office:
556 WEST 34th STREET
Phila. Office:
506 FRANKLIN BANK BLDG.

BRAKE SHOES

AMERICAN BRAKE SHOE
& FOUNDRY COMPANY

30 Church St., New York
322 So. Michigan Ave., Chicago
Chattanooga, Tenn.

This Space For Sale

NATHAN MANUFACTURING CO.
101 PARK AVE. NEW YORK.

1612 Old Colony Building, Chicago.

Monitor, Simplex and Nathan Injectors for Locomotives

AND

Sight-Feed Lubricators.

All Specially arranged for High-Pressure Engines.

STEAM FIRE EXTINGUISHERS FOR SWITCHING AND YARD ENGINES.

Boiler Washers, Boiler Testers, Rod and Guide Oil Cups, Etc.

SOLE AGENCY FOR THE

Coale Muffler & Safety Valve Co., Inc.

ESTABLISHED 1884

SIPE'S JAPAN OIL

"STRENGTHENS, DRIES, AND WATERPROOFS;
Add Sipe's Japan Oil And Improve the Paint".

IN DAILY USE BY ALL THE LEADING RAILROADS IN THE UNITED STATES

MANUFACTURED ONLY BY

CHICAGO ILL. **JAMES B. SIPE & CO.** PITTSBURGH, PA.

LOCOMOTIVE BLOW-OFF

DOES SATISFACTORY WORK ON MANY ROADS.

Can be worked from cab or foot board while running.

A catalog or call by Representative for the asking.

Homestead Valve Mfg. Co.,

Works: Homestead, Pittsburgh, Pa.

=: FARLOW DRAFT ATTACHMENT :=

For { **TWIN M. C. B. DRAFT SPRINGS**
OR
FRICTION DRAFT GEARS

THE T. H. SYMINGTON CO.

New York Chicago Baltimore Rochester

BALL'S
VARNISH REMOVER

OXOLIN
REGISTERED
THE IDEAL PAINT OIL

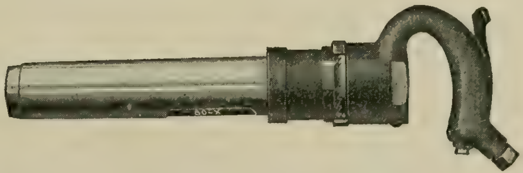
B. C.
SPIRITS

Ball Chemical Co.

CHICAGO Office,
63 W. Van Buren Street.

Fulton Bldg., PITTSBURGH, PA.

Logical Construction
is a feature of
BOYER
Pneumatic Hammers



No. 80X Boyer Riveting Hammer. Capacity 1⅜ inches.
Length overall only 21⅜ inches.

Boyer Hammers are made in three parts, cylinder, handle and valve—a construction which facilitates examination, cleaning and repairs, and extends the life of the tool indefinitely.

Write for Hammer Bulletin 124.

CHICAGO PNEUMATIC TOOL CO.

PITTSBURGH: 10 and 12 Wood St

1052 Fisher Bldg.
CHICAGO

Branches Everywhere

52 Vanderbilt Ave.
NEW YORK

H. H. HEWITT, PRESIDENT. W. H. CROFT. VICE-PRESIDENT

MAGNUS METAL

MEETS ALL HIGH-GRADE REQUIREMENTS.

IT IS THE STANDARD METAL

FOR LOCOMOTIVE WEARING PARTS,

JOURNAL BEARINGS FOR { FAST PASSENGER CAR SERVICE, HEAVY FREIGHT CAR SERVICE.

MAGNUS COMPANY

111 BROADWAY, NEW YORK.

DURABILITY COUNTS

DIXON'S SILICA GRAPHITE PAINT

is the "LONGEST SERVICE" paint. Recommended and largely used as standard by railroad economists, and engineers, throughout the entire world, for bridges, steel cars, tanks, signal apparatus etc. Made in FIRST QUALITY only. Write us for long service records and booklet No. 152-B.

Made in JERSEY CITY, N. J., by the

JOSEPH DIXON CRUCIBLE COMPANY

ESTABLISHED 1827

D X N TRADE MARK

RAILWAY SPECIALTIES

The National Malleable Castings Co.

CLEVELAND, CHICAGO, INDIANAPOLIS, TOLEDO,
SHARON, PA. MELROSE PARK, ILL.

MALLEABLE IRON AND STEEL CASTINGS

PEERLESS

MECHANICAL RUBBER GOODS AND PACKINGS HAVE THAT DURABILITY DEMANDED BY RAILROADS.

Peerless Rubber Mfg. Co.

31 WARREN ST. NEW YORK

BOSTON CHICAGO PHILADELPHIA MINNEAPOLIS

The Air Brake Game

today is a complicated one—and is growing more so daily. No longer will one general rule fit all cases—each individual case is a problem in itself, and as such must be met and solved. Our Engineering organization combines the experience of all railroad air brake engineers and, therefore, is specially fitted to take up and solve any and all air brake problems. Their services are free to our customers, who are requested to call them in on all air brake work, whether it be new specifications, modification of old equipment, or just ordinary, plain, every-day troubles.

Westinghouse Air Brake Co.

General Office, Wilmerding, Pa.

New York, City Investing Building; Pittsburgh, Westinghouse
Building; Chicago, Railway Exchange Building;
St. Louis, Boatmen's Bank Building.

Westinghouse
Electric Arc Welding Outfits

have reduced the repair costs in many railroad shops.
They save their cost in three months time.
Full information on request.—Booklet 3049-A.

Westinghouse
Electric Motors for Railroad Shops

Pressed-Steel Types for either alternating or direct
current. Rugged, serviceable, efficient and long lived.
Full information on request.

Westinghouse Electric & Manufacturing Co.

Sales Offices In All
Large American Cities

W
WESTINGHOUSE ELECTRIC

EAST PITTSBURGH
PENNSYLVANIA

2-10-2 TYPE LOCOMOTIVES

Total Weight of Engine, 352,500 pounds; Weight on Drivers, 293,000 pounds; Diameter of Drivers, 57 inches; Tube Length, 17 feet; Boiler Pressure, 190 pounds; Cylinders, 28x32 inches; Maximum Tractive Power, 71,200 pounds.

Because of its long rigid wheel base many railroad officials have had to eliminate the 2-10-2 type when considering more powerful locomotives.

Lateral motion driving axles and boxes were applied to the New York, Ontario & Western, 2-10-2 type locomotives to reduce the rigid wheel base to that which is in common use on Consolidation and Mikado type locomotives, and at the same time secure the advantages of the ten-coupled wheel arrangement with the resulting increased capacity of the locomotives.

Write us for further information regarding the lateral motion device

AMERICAN LOCOMOTIVE COMPANY
30 CHURCH STREET, NEW YORK

YOU GET THE MAXIMUM OF DURABILITY FROM OUR

SEMAPHORE ENAMEL

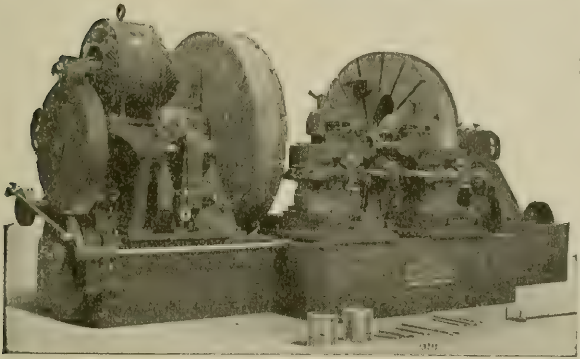
All colors—Write to us for samples.

Yarnall Paint Company
MANUFACTURERS - - - PHILADELPHIA

This Space For Sale

Railroad Repair Shop Equipment

Combining all modern features for
rapid, convenient operation.



MACHINE TOOLS

STEAM HAMMERS

ELECTRIC
TRAVELING
CRANES

P. & W.
SMALL TOOLS
AND M. C. B.
GAUGES

Niles New Model Driving Wheel Lathe
Has broken all wheel shop records.

WRITE FOR CATALOGUE

NILES-BEMENT-POND CO.

111 Broadway, New York. Pittsburgh Office, Frick Building.

---

500 RAILROAD SHOPS

Have Adopted Thermit Welding as a Standard for Frame Repairs

The list of railroads using Thermit includes practically every system from the small road having only a few locomotives to the largest system having many thousand locomotives.

The superheated liquid Thermit steel is produced in bulk and poured all at once into a mold surrounding a broken section, resulting in the perfect amalgamation of the Thermit steel with the parts with which it comes in contact. The fact that those parts are first preheated, makes the weld doubly sure.

Remember that the greatest railway systems in the world use hundreds of thousands of pounds of Thermit. They do not use it for any reason except that it "delivers the goods," and has proved itself the most profitable investment.

Full information is given in our instructive pamphlet No. 2167, "Thermit Locomotive Repairs," and shows how effectively and economically the process can be used. Send for a copy today.

GOLDSCHMIDT THERMIT COMPANY

120 BROADWAY, NEW YORK

329-333 Folsom St., San Francisco; 103 Richmond St., W.,
Toronto, Ont.; 7300 So. Chicago Ave., Chicago

THE BALDWIN LOCOMOTIVE WORKS

PHILADELPHIA, PA., U. S. A.

LOCOMOTIVES

OF EVERY DESCRIPTION

Electric Motor and Trailer Trucks

SECURITY

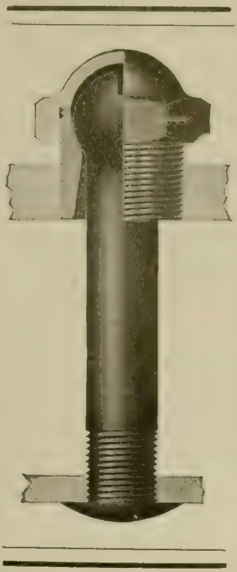
SECTIONAL ARCH

Makes staybolt inspection easy.
Saves flue troubles.
Reduces engine failures.
Easy to apply and remove.
Small brick of light weight.
Cools off quickly.
Many other good features.

AMERICAN ARCH COMPANY

30 Church Street,
New York

McCormick Building,
Chicago



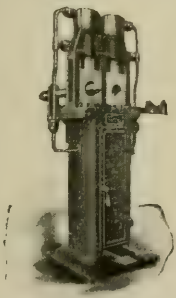
The Best Staybolt
FOR LOCOMOTIVE FIREBOXES

Railroads Are Now Using
The Tate Flexible Staybolt
At the Rate of
1,250,000 A YEAR

Our Services Are Always
At Your Command

FLANNERY BOLT CO.
Vanadium Building
PITTSBURGH, PENNA.
B. E. D. Stafford, General Manager

J. Rogers Flannery & Co.
SELLING AGENTS
Vanadium Building
PITTSBURGH, PENNA.



The Draper Manufacturing Co.
Manufacturers of
PNEUMATIC FLUE WELDERS

For Scarfing, Welding and Swedging Boiler Flues up to 4" Diameter.

Pneumatic Tube Welding Machines for Welding and Swedging Superheater Tubes.

Flue Reclaiming Equipment used in connection with Pneumatic Flue Welders.

HUNT-SPILLER IRON
HAS THE
STRENGTH AND WEARING QUALITIES
THAT ARE ABSOLUTELY NECESSARY IN
LOCOMOTIVE CASTINGS
PRICES MODERATE RESULTS GREAT
Manufactured Only By
Hunt-Spiller Manfg. Corporation
W. B. LEACH, President and Gen'l Manager.
OFFICE AND WORKS:
383 DORCHESTER AVENUE
SO. BOSTON, MASS.
J. G. PLATT,
Sales Manager.

GALENA-SIGNAL OIL COMPANY

FRANKLIN, PENNA.

Sole manufacturers of celebrated

GALENA LUBRICANTS

PERFECTION VALVE and SIGNAL OILS

and

Galena Railway Safety Oil

Manufactured for

STEAM AND ELECTRIC RAILWAY USES EXCLUSIVELY

Guaranteed Cost **Expert Service Free**

CHARLES MILLER,
Chairman.

S. A. MEGEATH,
President.

FORT PITT MALLEABLE IRON CO.

PITTSBURGH, PENNA.

MANUFACTURING SPECIALISTS
OF MALLEABLE CASTINGS
FOR THE RAILROAD AND
CAR COMPANY TRADE.

FEATURES

Superior Quality

Expeditious Delivery

Consistent Price

INDEX—ADVERTISERS.

NAME	Page
American Arch Co.	x
American Brake Shoe & Foundry Co.	iii
American Locomotive Company	viii
Baldwin Locomotive Works	x
Ball Chemical Co.	v
Brady Brass Co.	Front Cover
Butler Drawbar Attachment Co.	xviii
Chicago Pneumatic Tool Co.	v
Davis Brake Beam Co.	xxi
Dixon, Jos., Crucible Co.	vi
Flannery Bolt Co.	xi
Fort Pitt Malleable Iron Co.	xii
Galena Signal Oil Co.	xii
General Electric Co.	xvii
Gem Manufacturing Co.	Front Cover
Goldschmidt Thermit Co.	ix
Gould Coupler Co.	ii
Graham Nut Company	Front Cover
Homestead Valve Mfg. Co.	iv
Hunt-Spiller Mfg. Co.	xi
Independent Pneumatic Tool Co.	ii
Jacobs-Shupert U. S. Fire Box Co.	xvi
Johns-Manville Co.	xix
Johnson Bronze Co.	i
Locomotive Superheater Company	Front Cover
Magnus Company	vi
Manning, Maxwell & Moore	iii
McConway & Torley Company	xv
Nathan Manufacturing Co.	iv
National Car Wheel Co.	iii
National Malleable Castings Co.	vi
Niles-Bement Pond Co.	ix
Page Woven Wire Fence Co.	Front Cover
Peerless Rubber Mfg. Co.	vi
Pressed Steel Car Co.	xx
Railway Steel Spring Co.	xvi
Safety Car Heating & Lighting Co.	xvi
Schaefer Equipment Co.	xviii
Sipe, James B., & Co.	iv
Standard Coupler Co.	xix
Standard Heat & Ventilation Company, Inc.	xix
Standard Steel Car Co.	xviii
Steel Car Forge Co.	Front Cover
Stucki Co., A.	xxi
Suydam, M. B. Co.	Back Cover
The T. H. Symington Co.	v
The Draper Manf'g Co.	xi
The U. S. Metallic Packing Co.	xvi
Union Spring & Mfg. Co.	xiv
Union Steel Casting Co.	xix
Westinghouse Air Brake Co.	vii
Westinghouse Electric & Mfg. Co.	vii
Yarnall Paint Co.	viii

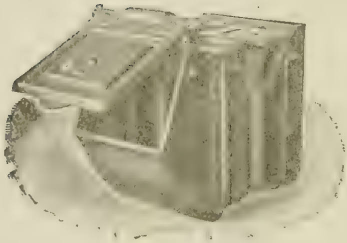
Union Spring & Manufacturing Co.

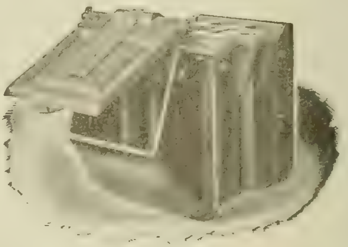
SPRINGS

Kensington All Steel Journal Boxes

PRESSED STEEL JOURNAL BOX LIDS

STEEL CASTINGS





Lightest and Strongest M. C. B.
Journal Boxes Made.

WORKS:
NEW KENSINGTON, PA.

GENERAL OFFICE:
First National Bank Bldg., Pittsburgh, Pa.

NEW YORK - 50 Church Street.
CHICAGO - Fisher Building.
ST. LOUIS - Missouri Trust Building.
RICHMOND, VA., AMERICAN NATIONAL BANK BUILDING.
LOUISVILLE, KY., 42 Todd Building.

OFFICIAL PROCEEDINGS

OF

The Railway Club of Pittsburgh

Organized October 18, 1901.

Published monthly, except June, July and August, by The Railway Club of Pittsburgh, J. B. Anderson, Secretary. General Offices, Penna. R. R., Pittsburgh, Pa.

Entered as Second Class Matter February 6, 1915, at the Postoffice at Pittsburgh, under the Act of March 3, 1879.

Vol. XVI.
No. 5.

Pittsburgh, Pa., March 23, 1917.

$1.00 Per Year
20c Per Copy

OFFICERS FOR 1916—1917

President
J. G. CODE,
General Manager, W. P. T. R. R.,
Pittsburgh, Pa.

First Vice President
H. H. MAXFIELD,
Supt. Motive Power, P. R. R.,
Pittsburgh, Pa.

Second Vice President
D. M. HOWE,
Paint Expert,
Pittsburgh, Pa.

Secretary
J. B. ANDERSON,
Chief Clerk, Supt. M. P., P. R. R.,
Pittsburgh, Pa.

Treasurer
F. H. STARK,
Genl. Supt., Montour R. R.,
Coraopolis, Pa.

Executive Committee

L. H. TURNER, Supt. Motive Power, P. & L. E. R. R., Pittsburgh, Pa.
D. J. REDDING, Asst. Supt. Motive Power, P. & L. E. R. R., McKees Rocks, Pa.
F. R. McFEATTERS, Supt. Union R. R., East Pittsburgh, Pa.
A. G. MITCHELL, Supt. Monon. Div., Penna. R. R., S. S., Pittsburgh, Pa.
F. M. McNULTY, Supt. Motive Power, Monon. Conn. R. R., Pittsburgh, Pa.

Finance Committee

STEPHEN C. MASON, Secretary, The McConway & Torley Co., Pittsburgh, Pa.
E. K. CONNEELY, Asst. to Vice President, P. & L. E. R. R., Pittsburgh, Pa.
CHAS. A. LINDSTROM, Asst. to President, Pressed Steel Car Co., Pittsburgh, Pa.
L. C. BIHLER, Traffic Manager, Carnegie Steel Co., Pittsburgh, Pa.
WALTER V. TURNER, Asst. Manager,
Westinghouse Air Brake Co., Wilmerding, Pa.

Membership Committee

FRANK J. LANAHAN, President, Fort Pitt Malleable Iron Co., Pittsburgh, Pa.
A. STUCKI, Engineer, Pittsburgh, Pa.
C. O. DAMBACH, Supt., W. P. T. R. R., Pittsburgh, Pa.
HARRY HOWE, Inspector of Castings, Pressed Steel Car Co., McKees Rocks, Pa.
R. L. KLEINE, Chief Car Inspector, P. R. R., Altoona, Pa.
B. E. D STAFFORD, General Manager, Flannery Bolt Company, Pittsburgh, Pa.
SAMUEL LYNN, Master Car Builder, P. & L. E. R. R., McKees Rocks, Pa.

Entertainment Committee

D. H. AMSBARY, District Manager, Dearborn Chemical Co., Pittsburgh, Pa.
HARRY MURDOCH, President, H. Murdoch & Co., Pittsburgh, Pa.
E. C. SATTLEY, General Manager, Page Woven Wire Fence Co., Monessen, Pa.

Past President

J. H. McCONNELL	October, 1901, to October, 1903.
L. H. TURNER	November, 1903, to October, 1905.
F. H. STARK	November, 1905, to October, 1907.
* H. W. WATTS	November, 1907, to April, 1908.
D. J. REDDING	November, 1908, to October, 1910.
F. R. McFEATTERS	November, 1910, to October, 1912.
A. G. MITCHELL	November, 1912, to October, 1914.
F. M. McNULTY	November, 1914, to October, 1916.

* Deceased.

Meetings held fourth Friday of each month, except June, July and August.

PROCEEDINGS OF MEETING, MARCH 23, 1917.

The meeting was called to order at the Assembly Room of the Commercial Club, Pittsburgh, Pa., at 8 o'clock, P. M., with President J. G. Code in the chair.

The following gentlemen registered:

MEMBERS.

Amsbary, D. H.
Anderson, A. E.
Anderson, J. B.
Armstrong, J. L.
Arnold, J. G.
Babcock, F. H.
Barth, J. W.
Bell, R. P.
Bihler, L. C.
Bloom, Chas. W.
Bosley, N. D.
Boyer, C. E.
Bradley, W. C.
Brewer, W. A.
Buffington, W. P.
Burket, C. W.
Cassiday, C. R.
Code, J. G.
Conner, W. P.
Converse, P. D.
Courson, C. L.
Courtney, D. C.
Cunningham, R. I.
Cunningham, W. P.
Dambach, C. O.
DeVore, H. T.
DuBarry, E. G.
Dickinson, F. W.
Emery, E.
Endsley, L. E.
Farquhar, L. C.
Fay, Frank L.
Fields, D. S.
Fitzgerald, D. W.
Flannery, J. Rogers
Frey, A. R.
Fulton, A. M.
Gale, C. H.
Gilg, H. F.
Grewe, H. F.
Gross, C. H.
Haver, W. M.
Haynes, J. E.
Heineman, W. G. H.
Hettler, R. C.
Heineman, L. E.
Hindman, S. M.
Hink, G. L.
Hoffman, C. T.
Howe, D. M.
Jones, L. B.
Kinch, L. E.
Kinter, D. H.
Kleine, R. L.
Kohl, H. J.
Lynn, Saml.
Lynn, Wm., Jr.
Lanahan, Frank J.
Laurent, G. F.
Laylin, M. H.
Lehr, H. W.
Lindner, W. C.
Lindstrom, Chas. A.
Lobez, P. L.
Long, R. M.
Marshall, W. T.
Maxfield, H. H.
Mensch, E. M.
Meyers, J. M.
Mitchell, A. G.
Murdoch, Harry
McConn, G. E.
McKinstry, C. H.
McNulty, F. M.
Orchard, Chas.
Pennepacker, N. W.

Pratt, I. D.
Rabold, W. E.
Ralph, J. E.
Rogers, W. R.
Sampson, W. F.
Sattley, E. C.
Searles, E. J.
Schaich, Wm. F.
Sewell, H. B.
Smith, D. W.
Smith, J. B.
Stanton, Thomas
Stark, F. H.
Stevenson, Robert
Stucki, A.
Taylor, James
Thiele, Chas. F.
Thomas, J. H.
Trainer, M. N.
Tucker, J. L.
Walthers, G. C.
Zimmerman, S.

VISITORS

Anger, J. G.
Armstrong, G. D.
Boring, T. J.
Brinsley, H. A.
Clark, Harvey
Grafton, N. M.
Harrimann, H. A.
Kelm, A. W.
Kleine, H. J.
Knight, E. A.
Machin, Edwin
Miller, E. N.
Myers, W. H.
Mueller, M. C.
Neagle, W. C.
Parry, F. C.
Pfahler, F. P.
Pfeiffer, C. A.
Roth, P. J.
Simpson, Robert
Smith, E. N.
Smith, P. F., Jr.
Stalligan, J. B.
Swearingen, Joseph M.
Tibbals, S. B.
Walker, J. W.
Walker, Sylvester
Zafra, Carlos de

PRESIDENT CODE: We will dispense with the roll call, as we have the record of attendance through the registry cards, and unless there is objection the minutes of the last meeting will be approved as submitted for publication. Hearing none, they are so approved.

The Secretary read the following list of applicants for membership:

Ayres, W. C., Foreman Car Department, P. C. C. & St. Louis Railway, 114 Railroad Avenue, Carnegie, Pa. Recommended by R. L. Kleine.

Beegle, F. W., Chief Clerk, Delivery Department, Union Steel Casting Company, 62nd and Butler Street, Pittsburgh, Pa. Recommended by J. P. Allen.

Boring, T. J., General Foreman, M. C. B. Clearing House, P. R. R., Altoona, Pa. Recommended by R. L. Kleine.

Brann, W. S., Superintendent Coal Docks, Union R. R., Duquesne, Pa. Recommended by Frank Gibson.

Brock, Jesse, Foreman Car Department, P. C. C. & St. Louis Railway, 410 Morrow Avenue, Pittsburgh, Pa. Recommended by R. L. Kleine.

Cawley, C. F., Work Inspector, P. C. C. & St. Louis Railway, 3127 Brunot Avenue, Pittsburgh, Pa. Recommended by R. L. Kleine.

Curtin, J. J., Work Inspector, M. C. B. Billing, P. C. C. & St. Louis Railway, 207 Corliss Street, Pittsburgh, Pa. Recommended by R. L. Kleine.

Daly, P. J., Gang Foreman Car Department, P. C. C. & St. Louis Railway, 500 West Carson Street, Pittsburgh, Pa. Recommended by R. L. Kleine.

Donaldson, D. B., Traffic Manager, B. Nicoll & Company, 547 Wabash Building, Pittsburgh, Pa. Recommended by J. G. Code.

Donaldson, G. C., Draftsman, Pressed Steel Car Company, Allison Avenue, Emsworth, Pa. Recommended by J. G. Code.

Douglass, W. N., Gang Foreman Car Department, P. C. C. & St. Louis Railway, 117 Railroad Avenue, Carnegie, Pa. Recommended by R. L. Kleine.

Durham, George, Superintendent Motive Power, W. & L. E. Ry., Brewster, O. Recommended by C. O. Dambach.

Grafton, N. M., Railway Electrician, Pittsburgh Railways Co., 46 Greenbush Street, Mt. Washington, Pittsburgh, Pa. Recommended by W. P. Conner.

Green, A. Roy, Pittsburgh Representative, Standard Steel Works Company, 1416 Oliver Building, Pittsburgh, Pa. Recommended by Henry F. Gilg.

Groves, W. W., District Manager, Railway Audit and Inspection Company, 831 Frick Building, Pittsburgh, Pa. Recommended by W. P. Conner.

Hadley, L. E., Gang Foreman Car Department, P. C. C. & St. Louis Railway, 408 Ridge Avenue, Carnegie, Pa. Recommended by R. L. Kleine.

Howat, C. W., Assistant Engineer of Tests, Union Steel Casting Company, 62nd and Butler Streets, Pittsburgh, Pa. Recommended by J. P. Allen.

Kirkpatrick, H. F., Chief Clerk Sales Department, Union Steel Casting Company, 62nd and Butler Streets, Pittsburgh, Pa. Recommended by J. P. Allen.

Linehan, M. J., Clerk, Car Department, P. C. C. & St. Louis Railway, 3136 Allendale Street, Pittsburgh, Pa. Recommended by R. L. Kleine.

Ludwig, K. A., Painter Foreman, Car Department, P. C. C. & St. Louis Railway, 221 Railroad Avenue, Carnegie, Pa. Recommended by R. L. Kleine.

Manion, S. R., Storekeeper, Car Department, P. C. C. & St. Louis Railway, 501 Seventh Avenue, Carnegie, Pa. Recommended by R. L. Kleine.

Montgomery, J. L., Chief Accounting Clerk, Union R. R., 1417 Carnegie Building, Pittsburgh, Pa. Recommended by W. C. Bradley.

McCaffrey, H. A., Assistant Foreman Car Department, P. C. C. & St. Louis Railway, 50 Linwood Avenue, Ingram, Pa. Recommended by R. L. Kleine.

Oesterling, I. J., Inspector, Westinghouse Air Brake Company, 812½ North Evans Avenue, McKeesport, Pa. Recommended by W. R. Llewelyn.

Perkins, Charles F., General Manager, Davis Brake Beam Co., Box 192, Johnstown, Pa. Rocemmended by Frank J. Lanahan.

Price, George L., General Foreman Boiler Makers, American Locomotive Company, 1211 Fayette Street, Pittsburgh, Pa. Recommended by B. E. D. Stafford.

Replogle, H. L., General Sales Representative, Davis Brake Beam Company, Box 192, Johnstown, Pa. Recommended by Frank J. Lanahan.

Seiss, W. C., Foreman Car Inspectors, P. C. C. & St. Louis Railway, 2786 Zephyr Avenue, Sheridanville, Pittsburgh, Pa. Recommended by R. L. Kleine.

Smith, P. F., Jr., General Superintendent Motive Power, Penna.

Lines West, 1002 Pennsylvania Station, Pittsburgh, Pa. Recommended by H. H. Maxfield.

Staneart, R. A., Gang Foreman, P. C. C. & St. Louis Railway, 3065 Merwyn Avenue, Pittsburgh, Pa. Recommended by R. L. Kleine.

Thiele, C. F., General Car Inspector, P. C. C. & St. Louis Railway, Columbus, Ohio. Recommended by R. L. Kleine.

Tibbals, S. B., Foreman Car Department, Montour R. R., 1623 Ridge Avenue, Coraopolis, Pa. Recommended by F. H. Stark.

Trainor, J. A., Sales Department, The Baldwin Locomotive Works, Philadelphia, Pa. Recommended by J. G. Code.

Uhler, J. Lloyd, Metallurgist, Union Steel Casting Company, 62nd and Butler Streets, Pittsburgh, Pa. Recommended by J. P. Allen.

Yeardley, H., Assistant Foreman Car Department, P. C. C. & St. Louis Railway, 73 Ridge Avenue, Ingram, Pa. Recommended by R. L. Kleine.

PRESIDENT: Upon approval by the Executive Committee the gentlemen whose names have been read will become members by the payment of one year's dues.

I am going to vary the programme a little as one of our speakers has another engagement. We are all of us aware of the importance at all times of the Red Cross work, and of the much greater importance which it assumes now in our relations to the world, Mr. J. Rogers Flannery will now have a few moments to present to you the subject of the Red Cross organization.

Mr. Flannery spoke in part as follows:

"Mr. President and gentlemen, it is quite an unexpected pleasure to talk before you but we have been going through a very strenuous campaign for the last five days in response to a call from Washington. And I am glad to have the opportunity to speak to you because you above all others can appreciate it.

"When that began about a month ago which is most likely to culminate in war, word was sent out from Washington to mobilize all the resources of the Red Cross as quickly as possible and to get as large a personnel as possible. An appeal was sent out for a million members. Pittsburgh, with all her representatives, did not have a Red Cross Chapter. One was immediately formed, an executive committee appointed, of which I was unfortunately made chairman, and we were immediately notified to get at least 25,000 members by the first of April.

"And I want to say to you that there is just as much need today for a Red Cross as for a larger army, because 80% of the deaths in the last few wars of the United States were due to wounds and disease through lack of Red Cross supplies and medical attention, due no doubt to lack of foresight in looking after these men just before trouble came and everybody was so unprepared. In the Spanish-American war there were only 280 men killed in battle and 6,000 died of disease and things that could have been prevented if we had had the right kind of Red Cross.

"And I want to say to you we are going after this thing. We have about seventeen different groups working, we have organized the boroughs outside, the state educational institutions, a great many of the steel corporations, a great many of the manufacturing corporations, and we have touched practically every phase of activity. And for the first time in history the Board of Education has allowed this matter to be presented in the public schools. This is not a woman's proposition. I was like you, until three years ago I looked upon it as a woman's proposition, but that is the most ridiculous mistake that ever was made. We have our great hospital units, sanitary detachments and ambulance corps. Do you know that when this war arose in Mexico and we sent our troops to the border there was not a single base hospital unit in the United States. And you must remember that until recently we only had an army of 100,000 and a medical corps sufficient to take care of those 100,000. Now the first call is for 500,000 and we need doctors and nurses and personnel most urgently.

"What I want you to do in the first place is this. If your President will permit I want to send out a blank to every single member of this organization and I want you to sign it. But do not think you are done then for you are not. If you are an executive of a corporation, a foreman of a shop, a superintendent of a mine—the big corporations are sometimes using their safety first committees—get the men under you to take an active part in the Red Cross movement. Pittsburgh must come to the front and she has not done it. We ought to be ashamed of ourselves. We are the only great city in the country that has not at least one hospital unit or sanitary detachment or something of that kind. We have done absolutely nothing and it is time we did something.

"I am in the railway manufacturing business and like you I have not time to go running around with this kind of business. But I was called on and I am now calling on you and I want every single man that is here tonight to do his bit. We must do it and do it before the first of April. Start right now."

PRESIDENT CODE: I think I can assure Mr. Flannery that he will get the information that will enable him to reach every member.

We will now revert to our regular programme and take up Reports of Committees. First, the Report of the Committee on Revision of M. C. B. Rules of Interchange, which will be presented by the Chairman, Mr. R. L. Kleine.

ANNUAL REPORT OF THE STANDING COMMITTEE ON REVISION OF M. C. B. RULES OF INTERCHANGE.

To the Officers and Members of
The Railway Club of Pittsburgh.

GENTLEMEN:

Your Standing Committee on the Revision of M. C. B. Rules of Interchange held a meeting at the Colonial-Annex Hotel, Pittsburgh, on February 20th and 21st, 1917, to consider what modifications are desirable and necessary in the 1916 M. C. B. Rules of Interchange, both freight and passenger cars, and, herewith, beg to submit our report. While we consider all of the changes, omissions or additions recommended as absolutely essential, we would call particular attention to the following:

FREIGHT CAR RULES:

RULE NO. 3-g:

Marking date built on cars: Extending time from July 1, 1917 to July 1, 1918.

RULE NO. 3-j:

Cars of less than 60,000 pounds capacity having wooden or metal draft arms: Time extended from October 1st, 1917 to October 1st, 1918, account of the large number of refrigerator cars in service marked 50,000 pounds capacity.

RULE NO. 17-e:

The interpretation on this rule in which it is stated that the M. C. B. Association has no standard method of hanging brake beams is in error as there is a definite M. C. B. standard for attaching the brake hanger to brake head.

RULE NO. 17-i:

Prohibiting welding of arch bars as it is an unsafe practice.

RULE NO. 33:

Making owner responsible for safety appliance repairs when made in connection with items of owner's responsibility.

RULE NO. 48:

Making delivering company responsible for loss of all-steel side doors, wooden or steel hinged side doors, wooden or steel hinged end doors, all-steel drop bottom doors and wooden or steel end gates.

RULE NO. 86:

Condemning limits for axles have been more clearly defined and the limit for over-all length added.

RULE NO. 101:

Material prices for brake beams should be included in the Rules. At present these prices are obtained from outside publications which are not uniform for the same beam and it is proper that these prices be shown in the Rules the same as other prices.

PASSENGER CAR RULES:

RULE NO. 3:

Addition to this rule to cover responsibility for repairs and supplies to cars when handled in regular interchange instead of through line service.

RULE NO. 16:

Change in condemning limit of flat spot increased from 1 to 2 inches.

RULE NO. 18:

Changes in rates of depreciation. The present rates of depreciation for passenger cars are obsolete and should be changed to conform to present day conditions.

The detail changes in the Rules follow:

RECOMMENDED CHANGES IN THE 1916 CODE M. C. B. RULES OF INTERCHANGE.

PREFACE.

The question and answer on page 3, relative to the Specifications for Ordinary Tank Cars should be eliminated.

Explanation: The requirements of test have been changed in the 1916 Revision of the Tank Car Specifications, and the interpretation does not now apply, as the first time interval for classes Nos. 1 and 4, in the specifications differ from that prescribed for classes Nos. 2 and 3; and would recommend that the matter be referred to Committee on Tank Cars for proper interpretation.

RULE 2.

Section (e), add in brackets, at the end of this paragraph, "(See cut, page No. ....)."

Explanation: As a matter of handy reference for car inspectors, we believe that cut of the A. R. A. third rail and overhead clearances for electrical conductors should be incorporated in the Rules of Interchange. The cuts showing these clearances should be reproduced in the M. C. B. Rules of Interchange, in their present size, in order to facilitate legibility.

Section (f), third paragraph, second line, after the words "center plates," insert the words "and side bearings."

Explanation: There are a large number of freight cars now in service equipped with side bearings that are cast integral with the truck bolsters the same as center plates, and there would be considerable delay in making proper repairs to the car which would require ordering of new bolster; and, therefore, it is felt that truck bolsters with integral side bearing should be included in the exceptions.

Section (f), fifth paragraph, after the word "bolster" in the third line, add "also where body center plate bolts are applied from inside of car through center sills."

Explanation: There are a great many commodities that require the removal of the load in order to replace such center plate bolts, the same as required in renewing draft timber bolts.

Section (f), sixth paragraph, change "25 per cent" in third line to read "50 per cent."

Explanation: To expedite movement, it is felt that this limit should be increased to 50 per cent.

RULE 3.

Section (b), at end of paragraph, add the words "or American Continuous draft rods."

Explanation: This item is transferred from section (h) of this rule, to section (b), since they both pertain to drafts, and the present section (h) becomes effective October 1, 1917.

Section (c), first paragraph, add the following sentence;

"No. 1 M. C. B. Standard brake beam must not be used on cars having a lightweight in excess of 35,000 pounds."

Explanation: Recommend this addition to rule as a matter of information and ready reference for car inspectors and others.

Section (g), change date "July 1, 1917" to read "July 1, 1918."

Explanation: It is felt that sufficient time has not elapsed to have this work completed.

Section (g), third line, eliminate the word "originally."

Explanation: Cars rebuilt in accordance with M. C. B. Rule No. 112 are required to be stencilled "Built ....," which date really is not the original date built. Therefore, the word "originally" is misleading.

Section (h), eliminate.

Explanation: Same as given under Rule No. 3 section (b).

Section (j), first line, year to be changed from 1917 to 1918.

Explanation: Time extended on account of the large number of refrigerator cars of 50,000 pounds capacity still in service.

Section (f), (i) and (m), omit reference to date in each section.

Explanation: Requirements will be effective as of October 1, 1917, date revised rules are in effect.

RULE 9.

Under heading "M. C. B. couplers or parts thereof, R. & R.," add the following words within the bracket: "M. C. B. Type or M. C. B. 'D'."

Explanation: In order to distinguish between the old type M. C. B. Standard coupler, and the new M. C. B. Standard "D" coupler.

In the same bracket, last item, add the word "riveted" in front of "yoke," making this item read "Riveted yoke or key attachment."

Explanation: There are numerous yokes which are key attached to the coupler. This is necessary in order to apply the proper labor charges under Rule No. 107.

Add the following in bracket opposite reference to "Wheels and Axles, R. & R.":

"All markings on wheels and axles, as required by wheels and axles billing repair card; (if no marks are found on same, a notation to that effect must be made.)"

Explanation: This requirement properly belongs in Rule No. 9, as the billing repair card for wheels and axles provides for this information. Placing this requirement in Rule No. 9 will eliminate Rule No. 97.

Reference "Triple valve, R. & R." Transpose words "R. & R." from left side of page to right side, after the words "Make and type."

Explanation: Since Rule No. 60 clearly indicates that triple valve must not be cleaned on car, it should be required that the billing repair card should show the valve as R. & R., which will indicate to car owner that triple valve was removed from car and cleaned in accordance with requirement.

Add the words "paint, lead or mineral" in bracket opposite reference "General."

Explanation: This will take care of interpretation on pages Nos. 21 and 23.

After the heading "General," page 22, add section (f) now of Rule No. 17, which reads as follows: "Billing repair card must specify kind of material applied and removed, and bill rendered in accordance therewith."

Explanation: This section more properly belongs under Rule No. 9, which specifies information to be shown on billing repair card.

Last paragraph, beginning on second line, eliminate the words "paragraphs 5 and 7 of."

Explanation: The M. C. B. Specifications for Tank Cars were revised in 1916, showing heading "Test" under each of the four classes of tank cars, making the present reference incorrect.

RULE 12.

First paragraph, fourth line, after the word "company" add "subscriber to the M. C. B. Rules."

Explanation: It is felt that inspector signing joint evidence card should represent a railroad which is a subscriber to the M. C. B. Rules.

RULE 15.

After the word "cards" in the second line, add "or transfer or adjustment orders;" and after the word "cards" in the third line, add "or orders."

Explanation: Transfer and adjustment orders, as well as the cards now specified in the rule become lost or illegible, and should also be duplicated on request.

RULE 17.

Section (c), second line, after the first word "couplers," add "M. C. B. Standard 'D' couplers."

Explanation: To give the same proper protection that now obtains for the M. C. B. Temporary Standard coupler.

Section (d), second line, after the word "Standard," add "M. C. B. Standard 'D'."

Explanation: Same as given under Rule No. 17, section (c).

Section (e), interpretation page 31. This interpretation is contrary to the standard specifications of brake heads and sheet M. C. B. 17, which specifies definite fixed standard for attachment of brake hanger to brake head. It also conflicts with the text matter of sections (a) and (e) of this rule, which permit of billing the owner for any increased cost resulting from application of certain M. C. B. Standards in place of other M. C. B. Standards or Non-M. C. B. Standards. The point of attachment of the hanger to truck or car body is not in question; the point involved is the attachment of the hanger to the brake head, which is a definite M. C. B. Standard. It is recommended that this interpretation be modified to conform to the Standards and Rules of Interchange as now in force.

Section (f), eliminate.

Explanation: Account of being transferred verbatim to Rule No. 9.

Section (i), insert words wrought iron or mild steel "Arch bars" before "Brake shafts."

Explanation: On account of the uncertain results obtained by permitting the universal practice of welding arch bars, it is considered imperative, from a safety standpoint, to prohibit the welding of same.

RULE 20.

Last paragraph, in the second and fifth lines, change the words "as near as practicable thereto" to read "within ½-inch thereof."

Explanation: To provide a definite range from the maximum within which the coupler height must be adjusted. Some roads are interpreting "as practicable thereto" as meaning one inch from the maximum which often necessitates additional adjusting and charges after loading or unloading, as the case may be, shortly following the first adjustment.

RULE 33.

Add at end of this rule, "except when these items are replaced, repaired or renewed, in connection with owners' responsibility."

Explanation: Working under this rule as now defined puts the repairing road to an expense for which it is not responsible, and works an injustice in this respect.

RULE 36.

First paragraph, second line, page 66, after the word "varnished," add "or otherwise secured."

Explanation: There is an endeavor to evade this rule as it now reads, by securing advertisements with screws and wire.

RULE 48.

Second line, after the word "car," add "except loss of all-steel side doors, wooden or steel hinged side doors, wooden or steel hinged end doors, all-steel drop bottom doors and wooden or steel end gates."

Explanation: These features cannot be lost in fair usage, and should be cardable. They are very expensive, can be located and should be replaced before the car leaves the handling line.

RULE 57, Last paragraph.

In the first line, omit the words "After October 1, 1914."

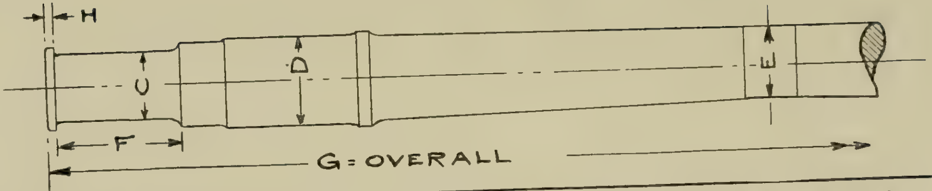
Explanation: Date is unnecessary, as the rule is already in force.

RULE 86.

Under heading "For Cars With M. C. B. Standard Axles, (four axles per car)." First paragraph, fourth line, page 108, change to read: "Axles must be removed from service as indicated by any of the limits prescribed in the following table." (This table is shown on following sheet).

Explanation: To provide ready reference and show more complete information relative to M. C. B. Standard axles under this rule.

M. C. B. RULE No. 86.



M.C.B. STANDARD AXLES AND ROAD LIMITS OF WEAR

A	B	C		D		E		F		G	H	
TOTAL WEIGHT	NOMINAL CAPTY.	M.C.B. STANDARD	REMOVE IF LESS THAN	M.C.B. STANDARD	REMOVE IF LESS THAN	M.C.B. STANDARD	REMOVE IF LESS THAN	M.C.B. STANDARD	REMOVE IF THIS LENGTH OR GREATER	M.C.B. STANDARD (MUST NOT BE LESS THAN SHOWN NOR MORE THAN 3/32" OVER)	M.C.B. STANDARD	REMOVE IF THIS THICKNESS OR LESS
LB.	LB.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	IN.	FT. IN.	IN.	IN.
210000	140000	6	5 1/2	7 5/8	7 3/8	6 7/16	6 5/16	11	11 1/2	7 – 6 3/4	7/8	1/4
161000	100000	5 1/2	5	7	6 3/4	5 7/8	5 3/4	10	10 1/2	7 – 4 1/2	3/4	1/4
132000	80000	5	4 1/2	6 1/2	6 1/4	5 3/8	5 1/4	9	9 1/2	7 – 2 1/2	3/4	1/4
95000	60000	4 1/4	3 3/4	5 3/4	5 1/2	4 3/4	4 11/16	8	8 1/2	7 – 0 1/4	5/8	1/4
66000	40000	3 3/4	3 1/4	5 1/8	4 7/8	4 1/4	4 3/16	7	7 1/2	6 – 11 1/4	5/8	1/4

NOTE÷ SEE RULES NOS. 29 AND 99 FOR SHOP LIMITS OF WEAR.

RULE 87.

Add the following:

"Joint evidence cards must be presented to company making improper repairs within one year from date joint evidence card is issued.

"Defect cards will not be valid unless presented within two years from date of issue, except when they are obtained in accordance with preceding paragraph. It should be understood that date of issue shown on defect card must correspond with the date wrong repairs were made."

Explanation: It is felt that all claims for defect cards for wrong repairs, or bills rendered on authority of defect cards, should be presented within this period. This rule will forestall the practice of some roads requesting defect cards for wrong repairs years after wrong repairs are made, during which time car owner had obtained service from same, and did not make correction until parts required renewal.

RULE 93.

Page 116, add after the word "recapitulation" in note, the following:

"The recapitaulation sheet must also show the name of officer and address to whom correspondence should be forwarded, relative to exceptions to charges; also, name of officer and address to whom remittance should be made."

Explanation: To promote uniformity and save time in handling correspondence. This will be of considerable aid to the billing department both in handling correspondence and preparing vouchers, as it will not be necessary to refer in each case to The Official Railway Equipment Register.

RULE 94.

First paragraph, third line, after the word "done," add "together with defect card repair slips shown on page No. ...., detailing labor and material used in making repairs." (Facsimile form shown below).

At the end of this paragraph, add the following:

"Form above referred to will be required in all cases, except where repairs are made on authority of defect card issued by owner of car repaired. In such cases, regular billing repair cards should be prepared, as per M. C. B. Rule No. 7. Defect card repair slip shall be made in duplicate, the original to accompany defect card, and the duplicate to be retained by company making repairs."

Explanation: To provide a distinguishing form, upon which to itemize the labor and material charges made on authority of defect cards, in order to enable an intelligent check of same; and also to maintain proper record of defect card charges, this detail information should not be shown on bill, as in many instances, the detail bill is filed by Auditors, and the defect cards by other departments.

M.C.B. ASSOCIATION — DEFECT CARD REPAIR SLIP

.... RAILWAY CO.

REPAIRS TO CAR PER M.C.B. DEFECT CARD; ISSUED AT .... DATE ....

END	REPAIRS MADE	NET PRICE	IRON			CHAIN	LUMBER	SPRINGS	HRS. LABOR	CREDIT
			CAST	WROT	MAL.					
	TOTAL									

DATE .... 191.... REPAIRED AT .... INSPECTOR .... KIND ....

CAR NO. .... INITIAL OR NAME .... CHARGEABLE TO ....

3½ x 8 IN. OR 7 x 8 IN.

ORIGINAL TO ACCOMPANY DEFECT CARD.
DUPLICATE TO BE RETAINED BY PARTY MAKING REPAIRS.

RULE 95.

Second paragraph, first line, after the word "jaws," add "safety chains."

Explanation: To conform to ruling of the Arbitration Committee, issued January 11, 1916.

RULE 96.

Revise bill statement shown on page 238, by relocating "Labor" column in blank space between "Miscellaneous" and "Cast Iron" columns.

Explanation: To facilitate entering labor charges on bill.

Also, eliminate "Chain" column.

Explanation: To provide more width of space in other columns. Charges for chain can readily be made in "Miscellaneous" column.

Also, specify dimensions for standard bill, full length and half length. (See facsimile below of revised form).

If above revisions are adopted, the billing repair card, record repair card and recommended defect card repair slips referred to in revised Rule No. 94 should be revised to correspond.

Explanation: Standard size bill forms are desirable in order to secure uniformity.

STATEMENT OF REPAIRS MADE TO .... CARS, PER M.C.B. RULES

BY .... RAILWAY COMPANY.

DURING .... 19......

REPAIRS MADE		CAR		DESCRIPTION OF PARTS REPAIRED	VALUE OF MISCELLANEOUS MATERIAL		LABOR HOURS	IRON			LUMBER	SPRINGS	CREDIT FOR SCRAP
DATE	PLACE	INITIALS	NUMBER					CAST	WROT	MALL.			
								LBS.	LBS.	LBS.	FEET	LBS.	LBS.
				QUANTITY,									
				PRICE									
				VALUE									
							TOTAL						
							CREDIT FOR SCRAP,						
							NET CHARGE,						

8½ × 14 OR 8½ × 8 IN.

RULE 97.

Eliminate.

Explanation: All information called for in this rule included in recommendation to add same to Rule No. 9.

RULE 99.

First paragraph, change to read:

"If car owner elects, on account of improper repairs, to remove an M. C. B. Standard axle unsuitable to the car, and apply a Non-M. C. B. Standard axle, he shall charge the average credit price for the Non-M. C. B. Standard axle applied and give credit for the value of the M. C. B. Standard axle removed, according to the price given in Rule No. 98."

Explanation: To conform to Circular No. 29, issued January 10, 1917.

RULE 101.

Item 20, add in bracket after the word "triple," the words "H-1-B and F-1-B."

Between present items Nos. 20 and 21, add new item, as follows:

"Cylinder front cap gasket (New York triple, types Gn-1, Gn-2, K-5 and K-6)................................$0.40."

Explanation: Catalogue prices show a difference for these items as indicated.

Item 96, omit words "pressed steel."

Explanation: An arbitrary price should be used for all kinds of box lids.

M. C. B. STANDARD BRAKE BEAMS AND PARTS. It is recommended that the Price Committee be instructed to place in this rule standard prices for M. C. B. Standard brake beams and parts for trussed and solid designs.

Explanation: The M. C. B. Association should not depend upon individuals to prepare price list for these articles. The price lists recommended for use show a multitude of prices for these parts, and further, the prices shown in the latest issue of the two computing tables mentioned in the interpretation on page 135 of the present rules are not uniform for the same make of beam. It is felt that the price of brake beams will not vary any more than the market price of couplers, and it is very desirable that standard prices be established for each class of brake beams; and can be accomplished without hardship to any road. This will insure uniformity and facilitate billing for repairs.

M. C. B. STANDARD COUPLERS AND PARTS. Prices for M. C. B. Standard "D" coupler and parts now given in M. C. B. Circular No. 20, dated November 10, 1916, should be incorporated in this rule.

Explanation: The prices given for the M. C. B. Standard "D" coupler and parts are based on present actual cost, whereas the prices given for other M. C. B. couplers and parts, were set some years ago, and are in no way comparative, either from present day cost standpoint or a per pound basis, and should be revised accordingly.

RULE 105.

Add new paragraph, as follows:

"Material furnished by owners for repairs to their cars, whether for individual car or for stock, should be billed in conformity with schedule of prices shown in these rules.

"No store expense should be added by repairing road to the net cost of material furnished by car owner, when ordered in accordance with M. C. B. Rule No. 122."

Explanation: The first paragraph is recommended in order to make clear just how bills for such material should be rendered; and the latter paragraph is recommended in order to conform to interpretation issued in Circular No. 20, dated November 10, 1916.

RULE 107.

Item 1, after the word "tacked," add "nailed, screwed or wired."

Explanation: To conform to recommended addition to Rule No. 36, first paragraph.

Item 5, eliminate.

Explanation: As per Rule No. 3, section (h), cars will not be accepted in interchange equipped with American Continuous draft rods after October 1, 1917.

Item 17, after word "repairing," add "other than welding."

Explanation: To conform to recommended addition to Rule No. 17, section (i).

Item 37, after the word "renewed," add "or replaced."

Explanation: The same amount of labor is involved, whether renewed or replaced.

Item 38, after the word "washer," add "or nut, either or both," making the item read "Body truss rod, washer or nut, either or both renewed, ½ hour."

Explanation: The regular allowance for nuts does not properly cover truss rod nuts, and if either is renewed, no additional labor is required to also renew the other.

Item 116, eliminate.

Explanation: Cars with stem or spindle coupler attachments have not been acceptable in interchange since October 1, 1914, (Rule 3-b); and cars equipped with American Continuous draft rods will not be accepted in interchange after October 1, 1917. (Rule 3-h).

Item 117, first line, change word "pocket" to read "riveted yoke."

Explanation: This item covers all pockets or yokes other than those key attached to coupler; and since the items associated with key attachment are covered in Items Nos. 120 and 121 of this rule, the words "pocket attachments" should be superseded by the words "riveted yoke attachments," in order to distinguish proper labor charges.

Item 147, change to read:

"Door batten (horizontal) (nailed door) renewed, not including R. & R. door, 1 hour."

"Door stile or filler (vertical) (nailed door) full length, 1 hour."

"Door stile or filler (vertical) (nailed door) full length, when siding is renewed over same, ½ hour."

"Door stile or filler (vertical) (nailed door) half length, ½ hour."

"Door stile or filler (vertical) (nailed door) half length, when siding is renewed over same, ¼ hour."

Explanation: These operations are not properly covered by present rule.

Items Nos. 159 and 160, add new item between these present items, as follows:

"Door hasp lock, one, renewed, 1 hour."

Explanation: To provide a labor charge for this operation.

Item 225, increase labor allowance from ¾ hour to 1¼ hours.

Explanation: To include regular allowance of 1 hour for raising end of car.

Item 262, after the word "application," add "wooden open top cars."

Explanation: This item is only intended for wooden cars and does not adequately compensate for similar operations on steel cars.

RULE 109.

Second paragraph, second line, eliminate word "pocket."

Explanation: Present reading confines it to pocket coupler, whereas the same reduction in labor cost of applying carrier bolts should be made when any coupler is removed and replaced.

RULE 111, page 198.

"Packing leather expander, renewed, (see cylinder piston), $0.07."

Change to read $0.09 instead of $0.07.

Explanation: To conform to Circular No. 20, dated November 10, 1916.

RULE 111, page 198.

"Release valve, renewed, $0.06."

Under details, change "Disconnecting release rod, $0.04," to read "Disconnecting release rods, $0.04."

Explanation: It is necessary to R. & R. both rods in renewing release valve, and to be consistent with second item following, which quotes $0.02 for removing and replacing each release valve rod.

It is recommended that items under Rule No. 111 be numbered, as per arrangements under Rules Nos. 101 and 107, which greatly facilitates when reference is to be made to any particular item.

RULE 113.

First paragraph, last line, after the word "tracks," add "who in turn may collect from the party responsible."

Explanation: To properly place the responsibility for damage occurring while handling cars on privately owned or jointly used tracks; it is no uncommon thing for several companies to do switching on the same private or joint tracks; and as the rule now stands, the party responsible for the damage may evade responsibility by claiming that under the rules he is not responsible, since he had not delivered the car on to such track.

RULE 115.

Second paragraph, fourth line, add before the words "scrap value," the words "depreciated or."

Explanation: The rules provide that all other trucks of all other capacities may be settled for at their depreciated value, and the same privilege should be afforded in cases of the lower capacities, as under certain conditions the scrap value may exceed the depreciated value.

Second paragraph, fifth line, change balance of rule to read "except that second-hand value will be allowed for all M. C. B. Standard metal brake beams good for further service, and the average credit price for wheels when settlement is made on scrap value basis."

Explanation: It is felt that no more than scrap value should be allowed for Non-M. C. B. Standard brake beams, which conforms to spirit of Rule No. 17, sections (a) and (e).

RULE 120.

Heading "DISPOSITION OF WORN-OUT CARS."

Change to read,

"DISPOSITION OF CARS REQUIRING EXTENSIVE REPAIRS FOR WHICH OWNERS ARE RESPONSIBLE."

> Explanation: Present heading is not broad enough to cover the cases reportable under this rule.

First paragraph, second line, after the word "repairing," add "including net charge of rivets."

> Explanation: In estimating labor cost of repairs, there is no clearly defined authority to include the net cost of rivets applied, the major portion of which is labor; and the rules should specify that the net cost of rivets be included in the estimated cost of labor. This will clarify the situation and provide for uniform practice.

First paragraph, fifth line, after the word "line," add "subscriber to the M. C. B. Rules."

> Explanation: It is felt that inspector signing joint inspection certificate should represent a railroad company which is a subscriber to the M. C. B. Rules.

RECOMMENDED CHANGES IN THE 1916 CODE M. C. B. PASSENGER CAR RULES OF INTERCHANGE.

RULE 3, Section (b).

Add new paragraph as follows:

"Delivering company shall be responsible for air, signal or steam heat hose missing from cars offered in interchange."

Explanation: This is a delivering company responsibility, but is not specifically covered in the present rules.

Section (c).

This paragraph defines items constituting line expense for cars operating in joint through line service, and we recommend that there be added to this rule, information showing responsibility for these items when occurring in regular interchange, as follows:

Add new section following section (c), as follows:

"Charges involving supplies or other expense that would ordinarily be included in Line Expense shall be handled in the following manner, when incurred on cars not operating in joint through line service:

Delivering Company Responsible

"(1) Ordinary daily cleaning, such as sweeping and dusting interior, wiping down or washing exterior, cleaning windows, etc. (In case this service is performed on private cars or business cars, the cost shall be charged against the car owner.)

"(2) Oil furnished to oil lighted cars.

"(3) Electric current furnished to electric lighted cars.

Delivering Company Responsible

"(4) Terminal heating. (The cost of heat furnished to private cars or business cars, shall be charged against the car owner.)

"(5) Candles and broken door and window glass. (Tool box, bulkhead or saloon glass, inside the car, will be owners' responsibility.)

Owners' Responsible

All other charges which would ordinarily have been included in Line Expense, had the car been operating in joint through line service.

In addition to the above, the following will govern:

(1) Gas in the receivers of gas lighted cars must be covered by a gas certificate at point of interchange, in accordance with Rule No. 17.

(2) Extra journal bearings supplied as equipment to private cars shall be charged to owners at M. C. B. rates.

(3) Carbon brushes applied to axle generators and carbon discs applied to regulators shall be charged to car owner.

(4) M. C. B. Rules and Prices covering repairs to freight equipment cars will govern in cases of repairs to cars of freight car construction, moving in passenger service. The M. C. B. Rules and Prices covering repairs to passenger equipment cars will govern in cases of repairs to cars of passenger car construction moving in freight service. In cases of cars of freight car construction, equipped with passenger car trucks, the M. C.

B. Rules and Prices covering repairs to passenger equipment cars will govern in cases of repairs to such trucks, whether in freight or passenger service. (This paragraph governs whether car is in regular interchange or joint through line service.)

Explanation: It is absolutely necessary to clarify this rule, in order to secure uniform method of handling these charges.

RULE 11, Section (a).

Second line, after the word "heating," add "of cars in line service and private or business cars."

Explanation: This change is made to clarify the rule.

Section (b).

At end of this section, add "if the delay is caused by the handling line."

Explanation: This change is made to clarify the rule.

RULE 16.

Second line, change the words "one inch" to "two inches," making the rule read "Flat spots; if flat spots, caused by sliding, exceed two inches in length."

Explanation: The practice of removing wheels from passenger equipment cars on account of flat spots less than two inches in length results in unnecessary expense for labor and loss of service metal, as flat spots less than two inches in length do not affect the safety of car, riding of the car, or the track structure.

RULE 18.

Change to read, "The depreciation of passenger equipment cars due to age shall be figured at the following rates per annum upon the so-called straight depreciation basis, to continue not to exceed the per cent of its original value as shown below. The above method of depreciation applies equally to either bodies or trucks of such cars. No depreciation shall be allowed on the value of air brakes:

Kind of Equipment	Rate Per Cent	Maximum Per cent
All steel	3	75
All steel underframe (Composite superstructure)	3	75
Wooden and other constructions not covered by above	5	85

Explanation: Wooden passenger equipment is becoming obsolete and further it is conceded that the rate of depreciation for wooden equipment should be higher than for steel equipment, and the maximum depreciation should be more commensurate in either case with the scrap value.

RULE 19.

Eliminate and combine with Rule 22, making Rule 22 read as follows:

> "This Code of Rules shall take effect October 1, 1917, and is to apply to all equipment interchanged in passenger trains."

Explanation: To simplify and condense the two rules.

Your Committee expresses its appreciation for the entertainment provided during their stay in Pittsburgh while formulating their report.

Respectfully submitted:

C. E. BOYER,
Pennsylvania Railroad, Lines East of Pgh.

G. E. CARSON,
New York Central Railroad, East of Buffalo

S. A. CROMWELL,
Baltimore and Ohio Railroad.

A. F. COULTER,
Union Railroad.

F. W. DICKINSON,
Bessemer and Lake Erie Railroad.

H. F. GREWE,
Wabash Pittsburgh Terminal.

W. J. KNOX,
Buffalo, Rochester & Pittsburgh Railroad.

S. LYNN,
Pittsburgh and Lake Erie Railroad.

C. F. THIELE,
P. C. C. & St. Loüis Railway.

F. T. HUSTON,
P. F. W. & C. Railway.

S. B. TIBBALS,
Montour Railroad.

R. L. KLEINE, *Chairman,*
Pennsylvania Railroad, Lines East of Pgh.

MR. H. H. MAXFIELD: I move that we adopt the recommendations of the Committee as a whole and with this action that we extend to the Committee our sincere thanks for the splendid work they have done in preparing and presenting this report.

The motion was seconded and prevailed by unanimous vote.

PRESIDENT: Without extensive preliminary remarks I take pleasure in introducing Mr. Carlos de Zafra, of the Telautograph Corporation, who will talk to you on the subject of the Telautograph.

THE TELAUTOGRAPH AS USED IN RAILWAY SERVICE.

By Carlos de Zafra, M. E.

The purposes of communications in connection with railway service are of utmost and even vital importance, and depend upon three main essentials:

(1) Speed (2) Accuracy (3) Responsibility

When we realize, THAT ONE TRAIN A FEW MINUTES OR A FEW HOURS late, and traveling over a complicated and inter-connecting railway system can completely upset the entire train schedule of the main and even the tributary lines, we will readily appreciate the necessity for the three essentials: Speed, Accuracy, and Responsibility, for the proper functioning of the various elements of that complicated system even with its routine schedule distorted.

We will likewise appreciate—as people upon whose shoulders depend the safe conduct of thousands of lives apart from valuable freight and mail—the necessity for those three essentials:—Speed, Accuracy, and Responsibility—to an even greater degree, (if that be possible), with a distorted train schedule than when everything is working with beautiful smoothness and routine becomes a second nature to the Towerman, the Train Dispatcher, the Yard Master, or the Mail Clerk.

What means of communication are available?

First and oldest is the Messenger, a legacy of days when runners with relays were the only means of quickly (?) transmitting news from one section to another. The messenger is as unreliable as humanity itself, for if the message be by word of mouth, and not written, it may, like gossip, be so distorted between the points of origin and final delivery as to be unrecognizable by its author and consequently, like gossip, do untold and possibly irreparable damage.

Again, the messenger, if given a written message may lose it, and still again, if the distance be great and the message be not forgotten or lost, its delivery will be slow and any acknowledgment back to the point of origin would require as long again as to deliver the original message in the first place. Should any correction of misunderstanding become necessary in the meantime it could not be made quite probably until too late. Although messenger service is still quite generally used in certain fields it is gradually but most certainly being replaced by other and more positive means. Its impracticability for railway use between points distant by a thousand feet or a thousand yards would be out of the question as a means of announcing incoming trains. In short the messenger affords neither speed, accuracy nor the placing of responsibility in the case of verbal messages, since there is no RECORD of the latter, while a written message, if lost, is equally useless, as a means of fixing responsibility.

Second and in great use over short distances, we have the pneumatic tube. These you have seen in the Department stores and also in the Mail Service as in New York where mail is sent many miles between sub-stations and the main post office.

The pneumatic tube is objectionable because of the liability of the carrier to jam in the tube, also, while faster than the messenger by far, it is not instantaneous and again, there is no means of preventing a message being changed by the recipient to cover an error unless a carbon copy for comparison be made at the point of origin. Also cost of maintenance and operation are factors of considerable importance and of greater moment than that of other systems.

Third and most generally used for long distances, is the telegraph. Here the chances of error are ever present while the time element is considerable between any two points consumed in putting the message into telegraphic code let alone transmitting an emergency message to say six or ten or as many as fifty stations from the same transmitting station. Besides there is no way of proving that the message actually was transmitted exactly as written (or spoken) to the operator, who, like the best of human beings, is liable to err either in transmitting or receiving. If received incorrectly how are we going to prove the receivers contention that it was received as sent—that it was "up to the other fellow"?

Fourth and the quickest of all so far considered, is the Telephone which transmits instantaneously a verbal message over thousands of miles. But even with its rapidity of transmission it is subject to vexations delays in getting the desired connection, which not infrequently results in several lost minutes due to "wrong number." Right here we find the "wrong number" may have been made through carelessness on the part of the "central" operator or through a *misunderstanding* either of the 'phone number or the desired exchange called. For general conversation the telephone no doubt serves most excellently but for *precision,* as is required in train numbers, time schedules and names of train crews, nothing can be too exact.

Again the telephone fails us in transmitting simultaneously to many stations—we can talk to only one at a time and for each separate connection we must repeat the chances of error and recall of operator to give us the right connection.

Another drawback to the telephone for such specific and important messages lies in its inability to record the message in the absence of the desired party from the station called making necessary one or more repetitions of the possible cycle of errors until we finally catch him "in".

Thus it is plainly seen that SPEED, ACCURACY and the placing of RESPONSIBILITY are difficult of accomplishment with the 'phone though possibly less so than by the methods already discussed.

Now, what we want to accomplish is:

(a) Instantaneous transmission of messages.

(b) Instantaneous transmission to one or, if necessary, to fifty stations *simultaneously* so as not to have to lose time and run the multiplied risk of introducing errors through repeating messages to each station separately.

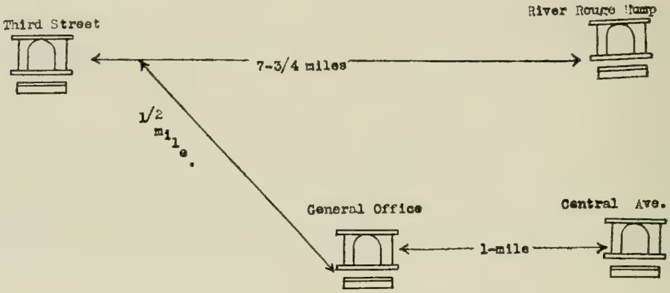
(c) A means whereby messages may be seggregated and sent to only those stations concerned. For instance, a message may relate to crew assignments and be of no interest to the announcer at the passenger in-coming Bulletin Board, yet this message may come from the same sending station. In other words, out of twenty stations in a communicating system some messages may be of importance to all twenty and should, in one operation, be transmitted to all *simultaneously and instantly.* Other messages may concern only four of the twenty stations hence the other sixteen must be eliminated in order to avoid confusing them. To do this some form of selecting device must be available.

(d) Some means must be available which will absolutely fix the responsibility for the message even should the sender omit his signature or other identifying mark. If the original hand-written copy cannot itself be sent—for the original copy is the usual "last resort" upon which responsibility for error is placed, what can be substituted that will be accepted unquestionably as "just as good"? How may we locate the responsible person even after the original copy may have been *deliberately* destroyed to remove evidence of error on the part of the sender?

These things and many more are readily accomplished by that ingenious electrical device known as the TELAUTOGRAPH which transmits instantaneously to one or fifty stations either fifty feet or fifty miles apart *the exact message in the exact handwriting of the original.* Now, what does this mean? We readily recognize memorandums as coming from Brown or Jones according to the handwriting in the absence of initials or signatures. Should Brown or Jones make an error he cannot remove the evidence except by going to each station to which it was sent to remove the record slip from the instruments and this would no doubt be both impractical as well as damaging. To remove the record from his own instrument alone does not remove the same record *in the same handwriting* from any other instrument in circuit at the time of message transmission. Therefore, knowing an original record is made and identically and simultaneously and instantly reproduced at every station in the circuit commands greater care on the part of the sender and thus reduces the chances of error.

By means of selecting key-switches the sender may select the group of stations which should receive the message in question, or he may send to all at once. A towerman may be much too busy to answer telephone calls, some of which may be errors, but the TELAUTOGRAPH, mounted in plain sight records the information in unmistakable writing and allows him the free use of his hands and ears at all times. Should an error be made such that he sets the wrong signal and loss of property and even life result, he has the evidence on his recording receiver to which to point as the authority for his act, and thus exonerated, the responsibility is readily and positively placed where it belongs.

The following are a few TELAUTOGRAPH Systems as installed in the Railroad Terminals and Stations as noted though there are about five hundred instruments performing railroad service now and the number is rapidly increasing:



Telautograph Service in use at Michigan Central Railway Co., Freight Department, Detroit, Michigan.

The Receiving Yards, River Rouge Hump, Central Avenue and Livernois Avenue are equipped with a transmitting station each. The Superintendent of Freight transfer is also equipped with a transmitting station. The Receiving yards report on the Telautograph the arrival of freight cars as follows:

R. R. Hump; date; Time of arrival of Train; R. R. car initials and car number; Consignee and contents.

Sample:

R. R. Hump 3-3-17.
Arrived 9:05 A. M.
P. M. No. 567 Lumber
West Virginia Lbr. Co.

The INBOUND Freight Clerk located at the Third Street General Freight Office received this message and O. K.'s receipt. The INBOUND Freight Clerk then refers to his Re-consignment List and looks up car number. If car is on re-consignment list he notes same on the Telautograph copy with number of re-consignment, in his book. He then continues through list until he has all cars noted that are re-consigned. He then orders these cars re-consigned to the new car owners and to their unloading platform as follows:

P. M. No. 587 Lbr. to Flint, Mich.
Flint Lbr. & Coal Co.

This car is then re-routed to Flint train and is delivered at Flint.

The INBOUND Freight Clerk also reports to the Receiving Yards where to deliver car for unloading and receives O. K. from Receiving Office.

Telautographs are gradually improving this branch of Railroad business and are of extreme value because of the following:

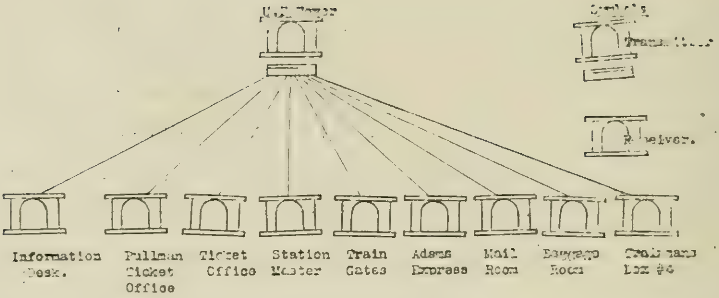
1. Absolutely eliminate errors in car numbers.
2. Cut out all waste time.
3. Reduce the loss of switching charges due to errors.

Showing How Errors Cost the Railroad Companies Money.

The INBOUND Freight Clerk on one line was sending car orders over the *'phone,* and, as was his custom, he held one waybill in his left hand and the 'phone in his right. He called off the Car number and initials and destination. The Receiving yard reported order and got as far as the number of the car and asked for the destination. The Inbound Clerk was reading the waybill in front of him, still holding the waybill in his hand and replied giving the destination. It was received by the Receiving Clerk at the Yard who sent the car to a Canadian point. It happened that the Inbound Clerk read the waybill in front of him and did not give the destination of the car from the waybill in his hand. This mistake was not discovered until the car had been reported as passing through the Windsor tunnel and too late to remove car. This error, only one of the many that are made *every day* cost the Railroad Company at least $45.00 cash, switching charges and mileage and tunnel charges.

A message in Cleveland was telephoned to a Yard Clerk and the error cost another Railroad Company $75.00 cash, because of a misunderstanding of destination. This error has never been nor ever will be placed on the right party.

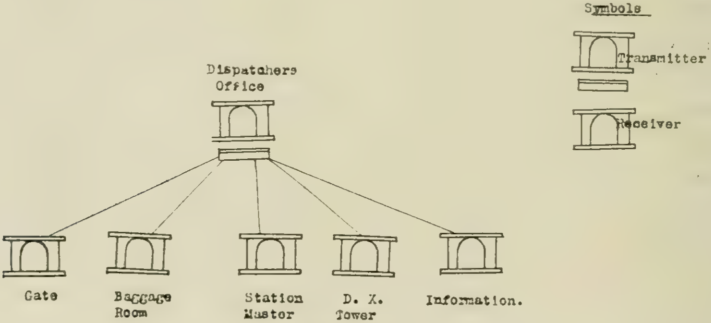
Actual instances of mistakes made in Telephonic communication could be secured by the writer, which, if added up for one year, would startle a Railroad Company.



Pennsylvania Railroad Service at Pennsylvania Station, Pittsburgh, Pa.

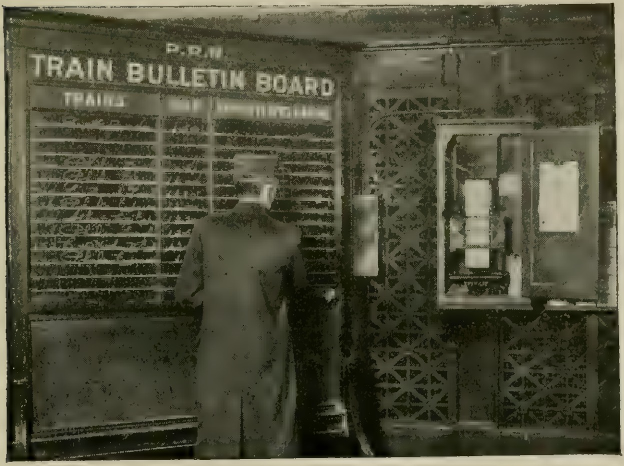
In addition to the above a Receiver Station is now being added at the Assistant Yard Master's Office at Box No. 3.

A further extension of value would be to add receivers at 28th Street and also another at the East Liberty Station, about three miles distant.



Pittsburgh & Lake Erie Service, Pittsburgh, Pa.

In the Pennsylvania Station in New York, where the photographs were taken, and in nearly every other large railroad terminal in the country, Telautographs are used to report the arrival and departure of trains and other train and engine movements.



Here is shown the train despatcher's office in Tower A. He sends announcements to fifteen or twenty different points, including the information bureau, telephone operators, concourses, shown at the right, waiting rooms, baggage porters, ticket offices and so on.

Kansis City Terminal to Hotel Muehlebach Service.

The co-operation between Railroad and Hotel information bureaus for the better accommodation of the public is well illustrated by the following memorandum sent me under date of

January 26, 1917, and referring to the proposed installation between the Kansas City Terminal and the Muehlebach Hotel.

The efficiency of such a service is large. Hotels with their traveling public rely on the Head Porter to find out for their guests information with regard to the time of arrival of trains, especially trains that are through trains or connect onto branch lines.

The Head Porter to obtain this information calls up the information switchboard of the station and the information clerk obtains this information from his Telautograph. Now, if the Head Porter has an instrument that records this information and connected in the circuit with the railway terminal announcing circuit, it would be unnecessary for him to call up his own switch-board and the information desk at the station and inconvenience the guests by making them wait for their information.

The Terminal gains in not having their 'phone line busy between the station and the hotel, and therefore have available a line for the better service to other inquirers. A room clerk can tell by the time of arrival of trains just what time his rooms will be in demand. For instance, The Hotel Blackstone in Chicago. The main arrival of guests come in on the Twentieth Century Limited and the hotel is run on the time this train comes in. For example: In the Baggage Department, on the arrival of the big trains, on which their home count relies, they hold all their porters on duty until these trains arrive.

Taxicab companies have at the station, when the trains arrive, a full force of cars, drawing from their other stands. If they have some means of finding out in a systematic way the arrival of trains that are late, they can arrange to keep their cabs at their regular stands until they are needed at the station.

Central Railroad of New Jersey, Jersey City, N. J.

This Terminal is Telautographically equipped as follows:

Tower "B", which is about 5,400 feet from the station, has a transmitter and pilot receiver. It can transmit to Tower "A" only, which is 3,100 feet nearer the station and 2,300 feet from it. Tower "A" can transmit to the Yardmaster, Station Master, the Sub-Station (in which three receivers are located in as many convenient positions), the Dispatcher, the Bureau of Information, the Baggage Room and the Ferry Master as this Railroad operates a connecting ferry service over the Hudson River to New York. The Station Master and the Dispatcher are each equipped with gransmitters and have the same service as Tower "A".

Boston Terminal, Boston, Mass.

There are here three services provided. One originates at the Train Dispatchers Office of the Boston and Albany system. Another originates at the Train Dispatchers Office of the New York, New Haven and Hartford system and the third originates in Tower No. 1, second floor of Train Directors Office.

The Train Dispatchers Office of the B. & A. system is located on the third floor of the Terminal Building and writes to each of the following receivers:

Position	Location	Distance
Information Bureau	First Floor, Terminal Building	125 feet
Waiting Room Bulletin Board	Ground Floor, Terminal Building	225 "
Station Master's Office	Mezzanine Floor, Terminal Bldg.	350 "
Train Director's Office	2nd Floor, Tower No. 1, in Yard.	1375 "

The Train Dispatchers Office of the New York, New Haven and Hartford system, located on the fourth floor of the Terminal Building writes to the same receiving points as the B. & A. Dispatcher, the distances in this case being:

Information Bureau	175 feet
Bulletin Board	275 feet
Station Masters Office	400 feet
Train Dispatchers Office	1450 feet

The third system originates at Tower No. 1 to announce the incoming trains and this information is instantly transmitted to the following places at each of which employees are awaiting information so as to promptly perform their respective duties:

Position	Location	Distance
Mail Room	First Floor, Terminal Building	500 feet
Inward Baggage Room	" " " "	550 "
Information Bureau	" " " "	1250 "
Bulletin Board	" " " "	1350 "
Outward Baggage Room	" " " "	1450 "
Station Master	Mezzanine Floor, Terminal Bldg.	1500 "

The following summary of other Railroad's uses of Telautograph Service may prove of interest:

Engine house and shop yard for announcing engine changes in making up trains, and for notifying shops concerning repairs necessary on engines.

Clearance Department writing to cashier, claim, bookkeeper and record department to ascertain amounts due employees about to leave service of Company.

From Telegraph room in Dispatchers Office writing to station platforms, yard master, coach yard master with reference to handling and movement of coaches.

Union Station—St. Louis, Mo.

Tower to Central leading Platform, Baggage Platform, Baggage Check Counter, Midway, Union Station Telegraph Office, Waiting Room, Information, and Telephone Information, giving track number and time of arrival of incoming trains, track number and time of setting of trains to prepare for loading, and time of departure of outgoing trains. Eleven machines are in multiple.

Union Station Telegraph Office writes to all the above stations simultaneously to announce the time late trains should arrive.

Washington Avenue Station—Branch of Union Station.

Tower to 2nd and 4th floor track levels, giving time of arrival of all trains (outgoing) stopping there from Union Station.

Brooklyn Rapid Transit

When men leave the employ of Company, the clearance department which has one set of machines which writes to all departments at once, namely: cashier, claim, bookkeepers and records, all these departments look up their accounts and write back to the clearance department what is coming to the men, or if the men owe the Company anything.

Pennsylvania Railroad Company—Philadelphia.

Used between Broad Street and West Philadelphia stations for announcing track changes, the running time of trains, and other information for the making up of trains.

West Philadelphia Engine House and Shop Yard System.

This system is used for announcing the engine changes for the making up of trains and also for notifying the shops just what repairs are necessary on the different engines.

P. B. & W. R. R. Company—Wilmington, Del.

Between chief train dispatcher and the chief transportation clerk, station Master's Office, ticket seller and baggage master, for announcing the running time of trains.

Pennsylvania Railroad Terminal—33rd and 7th Ave., New York.

Sending stations are:—Train Dispatcher, Room 24, second floor, "A" Tower in yard near Ninth Avenue, "O" Tower in yard near Seventh Avenue, Receiving Stations are: Train Dispatcher, Chief clerk, train service, second floor, inside information office, second floor, track No. 7 on grand concourse, track No. 14 on grand concourse, station master, outside information waiting room, baggage room, baggage passageway, exit concourse between main floor and track level Post Office, Eighth Avenue. "A" Tower, track level; car inspector office; "B" Tower; Long Island R. R. Station Master office; "C" Tower; Assistant Yardmaster's Office; "B" Tower; Yardmaster's office.

"A"—19 Multiple line.

"A" Tower writes up:—time of arrival and departure of all trains and track assignments of same, also changes of track assignment, general information or unusual changes in above.

Train Dispatcher writes up:—trains reported out of Washington, Harrisburg and Philadelphia, also time trains enter the Manhattan Division general information as to make up of trains, also bulletin of events likely to interest the heads of the different departments.

"C" Tower writes up:—arrival of Long Island trains and changes in track assignments of same if any.

St. Louis Terminal Association—Union Depot, St. Louis.

Transmitting Stations at station master's office and at Tower No. 1. Write to Cabin No. 60, Subway, Gate No. 16, Baggage Check Counter, Ticket Office, Information Bureau.

Also has transmitting stations at Washington Avenue Station, (first train stop in St. Louis) with receiving stations at two floors of the passenger station there. Used for train announcing and despatching at both depots.

Washington Terminal Company

1 Transmitter in dining room,

1 Receiver in pantry on first floor,

1 Receiver in kitchen on second floor.

three 20-multiple transmitters and 15 receivers.

Transmitting Stations:—Station master's office, sends out reports on running times of trains, trains clerk's office; orders concerning make up of trains, extra cars, etc., "K" Tower, sends out track assignments in case trains running late, necessary to change regular track assignments.

Kansas City Terminal Railway Company—Union Station.

Coach Order System. One transmitter with a pilot receiver located in the Telegraph room on the third floor of the Union Station, writes simultaneously to receivers located on East end of Station platforms, West end of Station platforms (both in train shed) yardmaster, coach yardmaster, and engine Dispatcher. The messages written pertain only to the movements of engines and coaches. This system saves the Kansis City Terminal Company, in messenger's wages and the cost of rollers for a copy in machines, which our system dispensed with more than $500.00 per annum, after deducting the expense of our service and aids greatly in the prompt dispatching of trains, permitting them to leave on time, as they were frequently delayed, under the old system, because of the slowness of messenger service and the unreliability of the telephone.

Kansas City Terminal Railway Company—Union Depot.

Train Dispatching System.

Three transmitters with pilot receivers write to fourteen stations—when one receiver writes, they all write—The transmitting stations are located as follows: Telegraph room (third floor of Union Station) Grand Avenue Tower at each approach to station, Penn Street Tower at West approach to station. Each of these write in multiple with the two other transmitting stations and at the same time write to station master's office, baggage check counter, baggage room in sub-basement, mail room, Usher's quarters, Gate No. 5 (East Midway) Fred Harvey's Commissary Department, passenger agents, quarters, information bureau, Adams Express Company, American Express Company.

Notice of the setting of trains are written to all stations, from Penn Tower and Grand Avenue, Towers and bulletins announcing the "lateness" of trains are written on the transmitting station in the Telegraph room.

In concluding my remarks and lest I have given you the impression that this instrument is limited to Railway uses let me say that it is in use in almost every line of business. Right here in Pittsburgh alone you will find them in retail and wholesale stores, in many of the banks, hotels, steel mills, stock broker offices, general manufacturing plants, and as a means of intercommunication between offices and also service is here being developed such that a firm, having its offices in Pittsburgh and its plant at some distant point can be on direct communication with that plant and transact such business as now requires messenger service. It makes no difference if the plant is fifty feet or fifty miles away.

Also; in manufacturing plants the instruments can be so wired up that any department writing to any other department also records its message on the receiver in the Managers or the Superintendents office so that the latter can periodically examine his record sheet and ascertain just what is going on in his plant—information which he might not be able to obtain by any other means.

The flexibility and possibilities of the Telautograph are unlimited. The day is coming when a firm here can write to its branch in Chicago or New York over a private wire or even by connecting to the regular telephone circuit. The distance is today a little greater than we can operate over but as soon as we have surmounted certain difficulties we have a standing order from a company which now telephones to each of those cities several times daily all of which has to be later confirmed by letter. Such confirmation is unnecessary in a Telautographically written message.

I thank you all for the honor you have given me to present this subject to you and will be pleased to attempt to answer such questions as may have suggested themselves to you.

DISCUSSION.

MR. C. O. DAMBACH: I would like to ask if you can get this writing down to a natural scale?

MR. de ZAFRA: You will find other messages in there where the writing is very small. Of course a machine will not improve ones handwriting and the larger the man writes the better.

MR. A. E. ANDERSON: What is the limit of successful operation of the system and how does it compare with the telegraph and telephone.

MR. de ZAFRA: The longest line which has ever been practically operated was between Philadelphia and New York. At the present time the longest plant is 37 miles. This service is between the offices of a wholesale druggist in New York (where orders are received) to the plant which ships the goods. Over the telephone a sulphide and a sulphate might be easily misunderstood. By telautograph such messages are transmitted with precision.

A large coal company also in New York receives orders only at its main office in the business section of the city. It has ten outlying distributing points. They have ten instruments each connected by private wire with the respective distributing stations. Five boys operate these ten instruments. There may be ten or twelve orders going through New York to one Branch and by the time these orders have been communicated there have accumulated enough other orders to communicate to another Branch. At the end of the day the central office can readily compute the entire output of any one of its Branches by simply looking over its records. It does not have to wait for a report to be sent in by messenger or mail.

In Chicago a brick dealer had an order for 20,000 brick from a contractor to be delivered at a point three miles distant from the brick yard. It came over the telephone and between the receiving of that order and the writing of the message to the order department an extra zero got in to it making 200,000. The error was not discovered until 80,000 were on the job, which meant the carting of 60,000 excess bricks three miles and the reloading and carting back, which was a very considerable sum to say nothing of losses through breakage.

MR. F. H. STARK: Is the instrument at the far end so fixed that you can send a message whether there is any one there to receive it or not?

MR. de ZAFRA: It will be automatically recorded there and it will be there waiting for your man when he comes back.

MR. STARK: The roll is out of sight?

MR. de ZAFRA: There is a roll placed on the top of the machine but it can be placed anywhere above. It is sometimes placed five or six feet up on the wall so that a yard or two of messages will be in sight for ready reference.

MR. STARK: If they do not have the complete equipment at the receiving end how does the office know that its order is being received?

MR. de ZAFRA: You always know that your receiving station is writing when you send a message from the transmitting station because the two transmitters, or fifty, work in unison and if your own is working you know the others are working also. There should, however, always be a transmitter at all important stations so as to allow a message being O.K'd.

MR. STARK: Suppose one of them is out of order?

MR. de ZAFRA: It will or will not affect the others depending upon the nature of the trouble.

There is one more application that has been brought to light within the last week or two, in view of the impending war conditions. Over the telephone conversation is not altogether private. It is possible for the operator on the switchboard to "listen in" or for any one to tap your wire and "listen in." With the telautograph communication is secret. You can not tap the wires between two stations and put another receiver in because in doing that you immediately throw out of tune all the others upon that line, thus giving an alarm.

MR. L. C. BIHLER: Mr. President, The Traffic Club of Pittsburgh is arranging for a moving picture entertainment at the Schenley Theater on Monday, April 23, 1917, to which the members of The Railway Club of Pittsburgh will be invited. It is the intention to have several moving pictures which will be of an educational nature and I am sure that the members of this Club and their ladies will appreciate the entertainment. Arrangements will be made to have the invitation extended to you through the regular channels.

PRESIDENT: I have a great confidence in the membership of The Railway Club of Pittsburgh and a very great confidence in the judiciary, which you will understand when you learn that after all the instructions and admonitions and oratory and good fellowship that we have had this evening I still have the nerve to call on Judge Swearingen to talk to us for a few minutes.

HON. JOSEPH M. SWEARINGEN: Mr. President and Members of The Railway Club of Pittsburgh:—I esteem it a great honor to be invited to be present this evening. When Mr. Lanahan, your good friend and mine, invited me to come he assured me that I would be highly entertained, and indeed I have been entertained by the proceedings this evening, although I do not pretend that I understand all that you have talked about. It is very evident that you gentlemen are alive to your business. And I find that your membership is not confined to railway officials alone but embraces other cognate interests and that you are endeavoring to be efficient in all your dealings and in all your activities.

I feel somewhat diffident about appearing here to make any address. My business is to instruct the Apostolic Twelve, and to come here and know that I can not instruct them puts me at a little disadvantage. It was suggested that I might make a few remarks on he subject of law. Now the law is at least more technical than the subjects with which you have to deal. For what is law? It has never been defined. It has been said that it is a rule of conduct, prescribed by the supreme power of the state, commanding what is right and prohibiting what is wrong and regulating matters in themselves indifferent. But what is the supreme power of the state and what is right and what is wrong, and what is a matter that is in itself indifferent?

After all, the law under which we live is a development of the particular society where its rule is recognized, and so there have been as many different bodies of law as there have been races of people or nations of the earth. Probably the greatest body of law that ever was formulated, prior to the English system, was that of the Roman Empire, which gave law to Europe and Northern Africa and Western Asia. And yet when you undertake to define law you can not do it, because it is a development, it is continually changing with the wants and the desires and the aspirations of the people.

The same is true of our own body of law. It originated primarily in England. It was brought here by our ancestors, But it is not the same today that it was 200 years ago by any manner of means. There has been a development according to the wants and the desires of the people themselves. We have a number of different kinds of law. We have in this country constitutional law, and we have statute law, and then we have what is known as the unwritten law—by which I do not mean the so-called law to which appeal is made in some States of this Union which is not very much to their credit.

A great mistake exists in the minds of most people as to the source of law. Many unthinking people seem to regard the statute law as the most important. And yet, take Pennsylvania for example, I venture to say that you can write in a book two inches thick the whole body of statute law that has been enacted from the time Penn set up his government in Philadelphia to the present time, which really affects the conduct of men in their associations and dealings with each other. That may seem a rather extravagant statement but I believe it is absolutely correct. The law which governs you and me in relation to our conduct as citizens, as members of the community in which we live, as members of our families, is after all the great Common Law which we inherited from our ancestors and which has been developed from time to time as occasion required.

Take the jury system. You all understand in a general way what the jury system is. No man can be placed upon trial for his life or liberty unless he shall have first been presented by a Grand Jury. Now whence comes the jury? No man knows where it originated. We all know there can be no verdict either in favor of the plaintiff or the defendant on the civil side of the court, or of guilty or not guilty on the criminal side, except by the consent of twelve men good and true. Whence came that institution? No one knows. It never was formulated in our statutes or in any statute that ever was written. It is one of those institutions that have grown up imperceptibly until it was finally established by judicial decision. And so of the rules of evidence.

You have had some experience in courts. On the civil side of the court you have heard the Court charge the jury that the case must be made out by the weight of the evidence. That means that the proof on the one side is greater than on the other. If any of you ever happened to be so unfortunate as to get into the criminal courts, you listened to a different rule pertaining there. No man can be convicted of crime unless the jury is satisfied beyond a reasonable doubt of his guilt. Now whence did those rules arise, whence came they? Their origin is shrouded in the mists of the past, no man knows where. And the same is true in regard to the kind of evidence that is admissible. The rule is that the best evidence must be produced of which the case is susceptible. If the contract between the parties be in writing nothing but that writing can be submitted as evidence. You can not listen to oral testimony on the subject. Whence came that rule. That had its origin in no statute anywhere.

I was interested particularly in the remarks of our friend on the telautograph. That is the adaptation of the very same principle in the transaction of the ordinary affairs of men, because common sense and experience have taught that the writing is that which does not change, which does not forget, either carelessly or wilfully.

Likewise where originated the rules as to the devolution of property? When a man dies his property passes to certain persons, those who held a certain relationship to him in life. Now those rules did not have their foundation in any written statute or any constitution or anything of the kind. They originated away back in the past. It is true they have been changed somewhat but the principle is the same.

I mention these matters to show you what I have suggested, that the rules which govern men in their conduct have their origin in what is known as the Common Law, that which is developing from day to day, a development which each nation makes for itself from time to time; and that those rules which govern conduct did not come from or find their origin in the statute laws which are passed by Congress or by State Legislatures. That is important for men to recognize, because while we act on them from day to day yet we do not think of it.

I do not want to get into a discussion, but there is one other matter that I wish to call to your attention for I think it is important. You are business men, you are men of affairs, you are men of importance in the communities where you live, and I do not see how any thinking man can help feeling that we are on the eve of very considerable changes in the affairs of our government. I am not speaking now of the war. There seems to be a feeling abroad that the law is on the defensive. It is a rare thing for one whose duty it is to administer the law to be commended for bringing a violator of the law to justice, and the tender-hearted administrator of the law who allows the criminal to escape is the one who is praised most in the clubs and in the newspapers. That does not seem to me to be the right spirit. It seems to me to indicate a feeling of unrest with our institutions which is not good. The right thing to do is to see that the law is obeyed; and if the law is violated the violator should be brought to justice so that he will learn to think in those terms as well as act on them. And no other spirit will generate in the hearts and actions of the people that respect for law which ought to be, because if it were not for law and its supremacy your house would come down over your head.

Now then, I do not know any body of men who can be more useful in the community where you reside to propogate correct ideas on subjects of that kind than this body of men. You are all from various walks of life, actuated by good purposes and desires for that which is best in your communities. We do know that there have been grave changes in recent years in our system of government. Witness, for example, these provisions which have been adopted from time to time in the way of commissions and boards and one thing or another of that kind which interfere with the right of private contract, with the right of a man to deal with his own as he sees fit so long as he does not injure his neighbor. Some of those things are doubtless good, and if properly administered will be of benefit to the people. But beware. Beware that the right of the individual to own his property, to do with it as he sees fit so long as he does not injure his neighbor, the right to life, liberty and the pursuit of happiness, be not impaired. For the time has not yet come when America, with all its memories, shall be governed by an autocracy or by a despotism. And it is the history of the past that even representative government may be said to be as tyrannical as that of a despot.

Now, gentlemen, I thank you most heartily for the pleasure you have afforded me tonight. I am glad to have been with you and I hope you may have all success in the worthy objects to which you have dedicated your efforts.

MR. FRANK J. LANAHAN: I think it proper that we should extend a vote of thanks both to Mr. de Zafra and to Judge Swearingen. I think the attention paid to the speakers testifies better than words that the enjoyment was ours in both instances, and I trust we shall have the pleasure of entertaining again both these gentlemen who have contributed to our pleasure this evening.

The motion prevailed by unanimous vote.

There being no further business,

ON MOTION, Adjourned at 10:25 P. M.

J.B.Anderson
Secretary.

RAILWAY CLUB NOTES.

The following subjects were presented and discussed by the several Railway Clubs during the month of March, 1917, as noted below:

New York Railroad Club, Harry D. Vought, Secretary,
95 Liberty Street, New York, N. Y.

SUBJECT—"Electrification of the N. & W. R. R." by C. H. Quinn.

New England Railroad Club, Wm. E. Cade, Jr., Secretary,
683 Atlantic Avenue, Boston, Mass.

SUBJECT—Annual Meeting.

Canadian Railway Club, Jas. Powell, Secretary,
P. O. Box 7, St. Lambert, near Montreal, Can.

SUBJECT—"Railways and Refractories" by H. P. Swinton.

Richmond Railway Club, F. O. Robinson, Sec'y, Richmond, Va.

SUBJECT—Unknown.

St. Louis Railway Club, B. W. Frauenthal, Secretary,
Union Station, St. Louis, Mo.

SUBJECT—"From Tree to Track" by J. H. Waterman.

Southern & South Western Ry. Club, A. J. Merrill, Secretary,
Box 1205, Atlanta, Ga.

SUBJECT—"The Evolution of the Chilled Iron Car Wheel" by F. O. Brunnell.

Central Railway Club Buffalo, N. Y., Harry D. Vought,
Secretary, 95 Liberty Street, New York, N. Y.

SUBJECT—"Report of Committee on Revision of M. C. B. Rules."

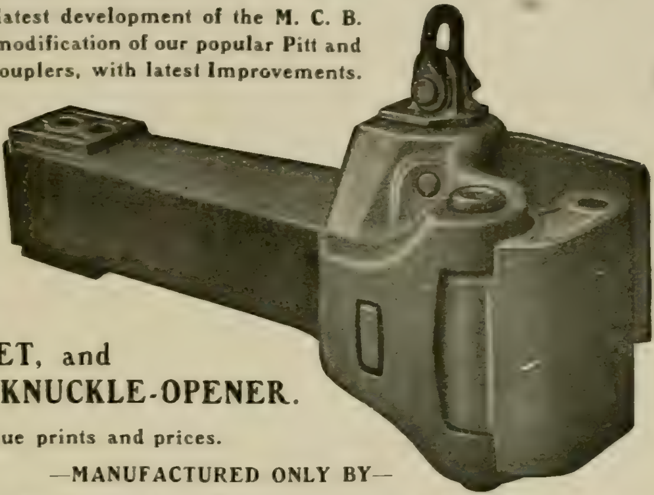
The Railway Club of Pittsburgh, J. B. Anderson, Secretary,
207 Penna. Station, Pittsburgh, Pa.

SUBJECT—"Red Cross"—"Report on M. C. B. Rules"—"Telautograph"—"What is Law."

Copies of the above papers can be had upon application to the Secretary at the address given for a nominal price.

THE PENN COUPLER

Our latest development of the M. C. B. Coupler, a modification of our popular Pitt and Janney X Couplers, with latest Improvements.



LOCK-
TO-
THE-
LOCK,

LOCK-SET, and
KNUCKLE-OPENER.

Send for blue prints and prices.

—MANUFACTURED ONLY BY—

THE McCONWAY & TORLEY CO.,
PITTSBURGH, PA.

This Space For Sale

PINTSCH MANTLE LIGHT

The system that has made good wherever it has been applied . . . .

SAFETY ELECTRIC LIGHT

Type "F" regulation ensures constant lamp voltage and long lamp life .

The Safety Car Heating & Lighting Co.

Chicago, Philadelphia, Washington, Boston,
St. Louis, San Francisco, Montreal

2 Rector St., New York

KING METALLIC PACKINGS

for Locomotive Piston Rods, Valve Stems & Air Pumps

SECURITY WRIST PIN
LEACH SANDERS
GOLLMAR BELL RINGER
INDESTRUCTIBLE OIL CUP
BRAIDED SWAB, ETC.

The U. S. Metallic Packing Co.
PHILADELPHIA

FIREBOX FACTS

1. Big locomotives have long wheel bases.
2. Long wheel bases must be covered by long boilers.
3. Long boilers mean excessive flue lengths.
4. Excessive flue lengths represent investment in heating surfaces of low evaporative values.
5. Shorter flues mean longer fire boxes.
6. Longer fire boxes (with combustion chambers) of the radial stay type are dangerous and introduce added stay bolt troubles.
7. The Jacobs-Shupert sectional fire box (and combustion chamber when required) supplies the means for designing locomotive boilers of correct economic proportions and at the same time for reducing maintenance problems to a minimum.

"YOURS FOR BETTER BOILERS"

Jacobs-Shupert U. S. Firebox Co.

30 Church St., New York. Works: Coatesville, Pa.

RAILWAY STEEL-SPRING COMPANY,

Springs,

Steel Tired Wheels,

Locomotive and Car Wheel Tires.

GENERAL OFFICE, 30 CHURCH STREET, NEW YORK

BRANCH OFFICES:—CHICAGO, ST. LOUIS, ST. PAUL, WASHINGTON, D. C.

Hundreds of G-E Planer Drives are in Successful Operation

The first G-E Planer Drive, built five years ago, and hundreds built since then are in use throughout this country. Repeat orders constantly testify to their splendid operating records.

Carefully consider the following advantages of this equipment:

Vastly more economical in operation and upkeep than any other existing drive.

Maximum cutting speed always sustained, giving greatly increased production.

Reverses remarkably close to a line.

Standard motor speeds 250—1000 r.p.m.

Many speed combinations, allowing slowest cutting and highest return speed to be combined.

Freedom from shocks, giving quickest reversals possible without jar.

Unexpected return of current to wires always finds motor and control apparatus ready to receive it.

Quiet operation.

Sparkless commutation.

Trouble proof control in easy reach of operator.

This equipment is conservatively rated and has ample power. Investigate the power rating of the motor you buy.

General Electric Company

GENERAL OFFICE
SCHENECTADY, NEW YORK

District Offices in

Boston, Mass.
Cincinnati, Ohio
St. Louis, Mo.

New York, N. Y.
Chicago, Ill.
Philadelphia, Pa.

Denver, Colo.
Atlanta, Ga.
San Francisco, Cal.

Sales Offices in all Large Cities 6545

STANDARD STEEL CAR COMPANY

OFFICES
General Offices: Frick Bldg., PITTSBURGH, PA.
NEW YORK: 170 Broadway
CHICAGO: Fisher Building

WORKS
BUTLER, PA.
NEW CASTLE, PA.
HAMMOND, IND.

STEEL AND COMPOSITE

FREIGHT CARS

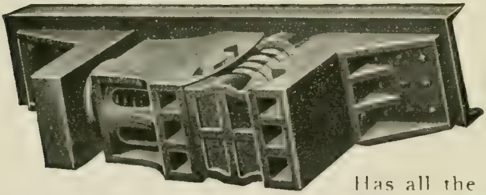
For all Classes of Service, from our Standard Designs,
or according to Specifications of Purchasers.

Steel Car Underframes

TRUCKS, BOLSTERS, BRAKE BEAMS, ETC.

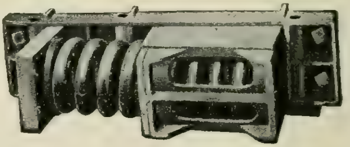
Capacity 50,000 Cars per Annum

INQUIRIES SOLICITED



USE BUTLER DRAFT GEARS
FRICTION RIGGING
PIPER PATENTS
200,000 lbs. Capacity.
Has all the points of a Perfect Gear

TANDEM SPRING ATTACHMENTS
6¼x8 or 8x8 DRAFT SPRINGS
PERFECT SPRING PROTECTION



Butler Drawbar Attachment Co.
Send for Catalog CLEVELAND, OHIO

SCHAEFER

DROP-FORGED
FOUNDATION BRAKE GEAR DETAILS,
COMBINE
MORE STRENGTH WITH LESS WEIGHT

Schaefer Equipment Company
Oliver Building Pittsburgh, Pa.

STANDARD STEEL PLATFORMS
ARE IN USE BY 281 COMPANIES

SESSIONS—STANDARD FRICTION DRAFT GEARS
ARE IN USE BY 205 COMPANIES

—BOTH MADE BY—

THE STANDARD COUPLER CO.

CHICAGO: People's Gas Building NEW YORK: 30 Church St.

J-M RAILROAD SUPPLIES

- Roofings
- Packings
- Gaskets
- Pipe Coverings
- Hair Felt
- Smoke Jacks
- Asbestos Wood
- Waterproofing
- Cork
- Fibre Conduit
- Locomotive Lagging
- Flexible Armored Squirt, Tank, Car Heating, Air Brake and Air Signal Hose
- Air Brake Expander Ring
- Steel Car Insulation
- Underground Conduit
- Asbestos Cements
- Brake Lining and Blocks
- Electrical Supplies
- Mastic Flooring
- Speedometers
- Fire Extinguishers
- Manual Slack Take Up for Air Brakes
- Vitribestos Stack Lining
- Refrigerator Car Insulation

Write for Catalogs

H. W. JOHNS-MANVILLE COMPANY

New York and Every Large City

Union Steel Casting Company,

PITTSBURGH, PA.

Steel Cast Locomotive Frames, Driving Wheel Centers, and Miscellaneous Locomotive Castings.

Vanadium Steel Castings a Specialty

Standard Heat & Ventilation Co. Inc.

Heating Apparatus for Railway Cars and Locomotives

Car Ventilators, Storage Battery Charging. Plugs and Car Receptacles.

165 Broadway New York

Freight and Passenger

CARS

Of Every Description

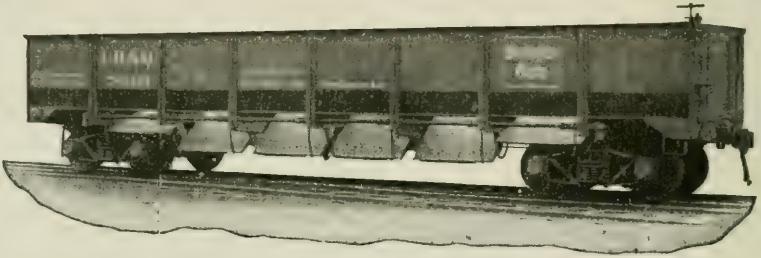
Pressed Steel Specialties

Tank Cars

Mine Cars

Pressed Steel
Car
Company

New York Pittsburgh Chicago St. Paul



FOR

GREATER EFFICIENCY

USE

DAVIS **SOLID-TRUSS** BRAKE BEAMS

FOR

Freight and Passenger Equipment.

ALSO

Pressed Steel Journal Box Lids.

DAVIS BRAKE BEAM CO.,

JOHNSTOWN, PA.

FRANK J. LANAHAN, Pres. CHAS. J. GRAHAM, Vice-Pres. H. L. REPLOGLE, Gen'l. Sales Rep

STUCKI
Side Bearings
SAVE WHEELS, RAILS, POWER
AVOID DERAILMENTS

A. Stucki Co.
Oliver Building
PITTSBURGH,
PA.

This Space For Sale

This Space For Sale

SUYDAM'S Protective PAINTS

For Freight Cars and Structural Steel Work

MANUFACTURED BY

M. B. SUYDAM COMPANY,

OFFICE AND WORKS, 61ST AND BUTLER STS.,
BELL 'PHONE, 343 FISK.
PITTSBURGH, PA

This Space For Sale.

Carnegie Library
of Pittsburgh

FOR SALE

BRADY BRASS CO.
MANUFACTURERS OF
CYPRUS BRONZE FOR LOCOMOTIVE and CAR BEARING USE
ENGINE CASTINGS BABBITT METALS
JOURNAL BEARINGS MOTOR BEARINGS
General Office and Works, 170-182 Fourteenth St. and 169-175 Fifteenth St., Jersey City, N. J.
DANIEL M. BRADY, PRESIDENT

TYPE A SUPERHEATER LOCOMOTIVES
Make firing easier Save coal and water
Haul longer trains Maintain faster schedules
LOCOMOTIVE SUPERHEATER COMPANY
30 Church St., New York. Peoples Gas Bldg., Chicago.

OFFICIAL PROCEEDINGS
RAILWAY CLUB OF PITTSBURGH
$1.00 Per Year 20¢ Per Copy

Vol. XVI. APRIL 27, 1917 No. 6

"WANTED—A FREIGHT CAR"

By A. M. SCHOYER

SCREW SPIKES
STEEL CAR FORGE COMPANY
"FORGING SPECIALISTS"
PITTSBURGH NEW YORK CHICAGO

FOR SALE

Electrical Uses
ARISTOS
"COPPERWELD"
Mechanical Uses
A COPPER CLAD STEEL WIRE
Product of the COPPER CLAD STEEL CO., Pittsburgh, Pa.
Drawn and Sold Exclusively by
PAGE WOVEN WIRE FENCE CO., - - Monessen, Pa.

FOR SALE

TORCHES

Gem Torches Save You Money

Exhaustive tests by largest railway systems have proven that Gem Brazed Seam Torches do save money. Let us prove it. Send for free sample and information.

Gem Manufacturing Company
PITTSBURGH, PA.

Graham Nut Company
PITTSBURGH, PA.
MANUFACTURERS OF
Hot Pressed Nuts, Cold Punched C. & T. Nuts
Bolts, Lag Screws, Washers, Etc

This Space For Sale

"Same Old Face!"

Well you see, boys it's the only one I ever had:

And it's served me pretty well. In fact I know of only ONE thing that has a service record anything like as good, and that's a

JOHNSON

loco. bearing. You've tried all the others maybe—had your troubles with 'em too. Why not give MY pets a chance NOW?

What say?

Then write

JOHNSON BRONZE COMPANY

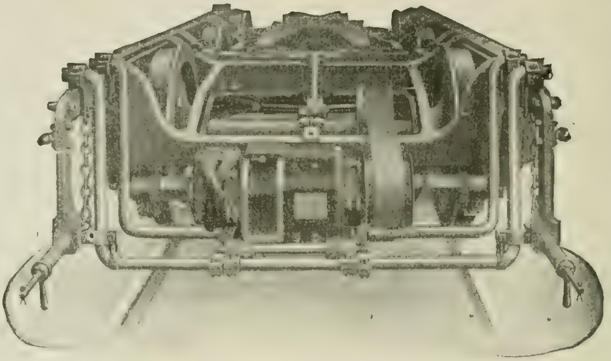
New Castle, Pa.

Sales Offices: New York, Buffalo, Cleveland, Cincinnati, Detroit Chicago, San Francisco

We also make
all styles and
sizes of
BRONZE
BUSHINGS

THE GOULD "SIMPLEX" SYSTEM OF

ELECTRIC CAR LIGHTING

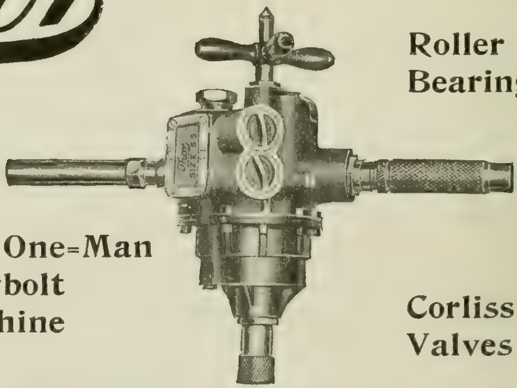


GOULD COUPLER CO.

NEW YORK

Thor

Roller-Bearing Compound Piston Air Drills



Roller Bearings

No. 32 L

The One=Man Staybolt Machine

Corliss Valves

FURNISHED ON TRIAL FREE. WRITE NEAREST BRANCH

INDEPENDENT PNEUMATIC TOOL COMPANY

Chicago : New York : Pittsburgh : Detroit : San Francisco : Birmingham : Montreal, Que.

MANNING, MAXWELL & MOORE,

ROBT. A. BOLE, MANAGER, PITTSBURGH BRANCH

PARK BUILDING

LONG DISTANCE TELEPHONE CALL. GRANT 67

Railway and Machinists' Tools and Supplies, Electric Traveling Cranes, Compressors, Pneumatic Hoists, Riveters and complete Machine Shop and Foundry Equipment

NATIONAL CAR WHEEL COMPANY

MANUFACTURERS OF

"STAR SPECIAL"

Reg. U. S. Patt. Off.

CHILLED CAST IRON CAR WHEELS

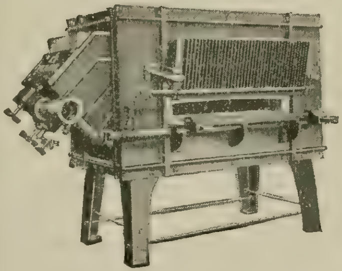
WORKS:
Rochester, N. Y. Pittsburgh, Pa.
Sayre, Pa. Cleveland, O.
New York City, N. Y.

General Offices:
PITTSBURGH, PA.
New York Office:
556 WEST 34th STREET
Phila. Office:
506 FRANKLIN BANK BLDG.

BRAKE SHOES

AMERICAN BRAKE SHOE
& FOUNDRY COMPANY

30 Church St., New York
322 So. Michigan Ave., Chicago
Chattanooga, Tenn.



Mahr Oil Furnaces

FOR

Annealing, Forging, Flanging and General Industrial Heating

Mahr Manufacturing Co.
Minneapolis

NATHAN MANUFACTURING CO.
101 PARK AVE. NEW YORK

1612 Old Colony Building, Chicago.

Monitor, Simplex and Nathan Injectors for Locomotives

AND

Sight-Feed Lubricators.

All Specially arranged for High-Pressure Engines.

STEAM FIRE EXTINGUISHERS FOR SWITCHING AND YARD ENGINES.

Boiler Washers, Boiler Testers, Rod and Guide Oil Cups, Etc.

—— *SOLE AGENCY FOR THE* ——

Coale Muffler & Safety Valve Co., Inc.

SIPE'S No JAPAN OIL TRADE MARK REGISTERED J.B.SIPE & CO MANUFACTURERS. ALLEGHENY, PA.

ESTABLISHED 1884

SIPE'S JAPAN OIL

"STRENGTHENS, DRIES, AND WATERPROOFS;

Add Sipe's Japan Oil And Improve the Paint".

IN DAILY USE BY ALL THE LEADING RAILROADS IN THE UNITED STATES

MANUFACTURED ONLY BY

CHICAGO ILL. **JAMES B. SIPE & CO.** PITTSBURGH, PA.

LOCOMOTIVE BLOW-OFF

DOES SATISFACTORY WORK ON MANY ROADS.

Can be worked from cab or foot board while running.

A catalog or call by Representative for the asking.

Homestead Valve Mfg. Co.,

Works: Homestead, Pittsburgh, Pa.

=: FARLOW DRAFT ATTACHMENT :=

For { TWIN M. C. B. DRAFT SPRINGS
OR
FRICTION DRAFT GEARS

THE T. H. SYMINGTON CO.

New York Chicago Baltimore Rochester

BALL'S
VARNISH REMOVER

OXOLIN
REGISTERED
THE IDEAL PAINT OIL

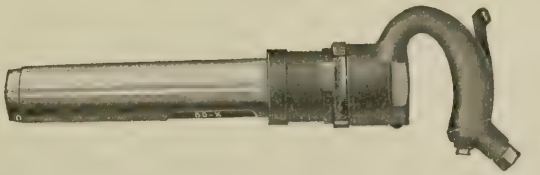
B. C.
SPIRITS

Ball Chemical Co.

CHICAGO Office,
63 W. Van Buren Street.

Fulton Bldg., PITTSBURGH, PA.

Logical Construction
is a feature of
BOYER
Pneumatic Hammers



No. 80X Boyer Riveting Hammer. Capacity 1⅜ inches.
Length overall only 21⅜ inches.

Boyer Hammers are made in three parts, cylinder, handle and valve—a construction which facilitates examination, cleaning and repairs, and extends the life of the tool indefinitely.

Write for Hammer Bulletin 124.

CHICAGO PNEUMATIC TOOL CO.

PITTSBURGH: 10 and 12 Wood St

1052 Fisher Bldg.
CHICAGO

Branches Everywhere

52 Vanderbilt Ave.
NEW YORK

H. H. HEWITT, PRESIDENT. W. H. CROFT, VICE-PRESIDENT

MAGNUS METAL

MEETS ALL HIGH-GRADE REQUIREMENTS.

IT IS THE STANDARD METAL

FOR LOCOMOTIVE WEARING PARTS,

JOURNAL BEARINGS FOR { FAST PASSENGER CAR SERVICE, HEAVY FREIGHT CAR SERVICE.

MAGNUS COMPANY

111 BROADWAY, NEW YORK.

DURABILITY COUNTS

DIXON'S SILICA GRAPHITE PAINT

is the "LONGEST SERVICE" paint. Recommended and largely used as standard by railroad economists, and engineers, throughout the entire world, for bridges, steel cars, tanks, signal apparatus etc. Made in FIRST QUALITY only. Write us for long service records and booklet No. 152-B.

Made in JERSEY CITY, N. J., by the

JOSEPH DIXON CRUCIBLE COMPANY

D X N TRADE MARK ESTABLISHED 1827 D X N TRADE MARK

THE NATIONAL

Quadruple Shear Yoke

FOR PASSENGER AND TENDER SERVICE

Illustrations and Details on Application

The National Malleable Castings Co.

Cleveland Chicago Indianapolis Toledo
Sharon, Pa. Melrose Park, Ill.

PEERLESS

MECHANICAL RUBBER GOODS AND PACKINGS HAVE THAT DURABILITY DEMANDED BY RAILROADS.

Peerless Rubber Mfg. Co.

31 WARREN ST. NEW YORK
BOSTON CHICAGO PHILADELPHIA MINNEAPOLIS

Specialization

Produces Highest Efficiency

* * * * *

Air Brake building is a business in itself—and one of the most important, because of the lives and property the Air Brake protects. It is a specialist's business, and to obtain best results, should be conducted by specialists.

* * * * *

Westinghouse Air Brake Co.

General Offices and Works, Wilmerding, Pa.

Westinghouse
Electric Arc Welding Outfits

have reduced the repair costs in many railroad shops.
They save their cost in three months time.
Full information on request.—Booklet 3049-A.

Westinghouse
Electric Motors for Railroad Shops

Pressed-Steel Types for either alternating or direct current. Rugged, serviceable, efficient and long lived. Full information on request.

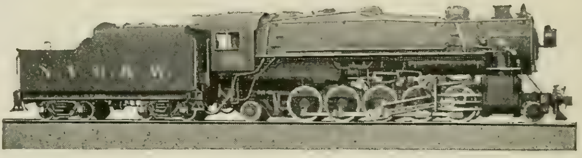
Westinghouse Electric & Manufacturing Co.

Sales Offices In All
Large American Cities

WESTINGHOUSE ELECTRIC

EAST PITTSBURGH
PENNSYLVANIA

2-10-2 TYPE LOCOMOTIVES



Total Weight of Engine, 352,500 pounds; Weight on Drivers, 293,000 pounds; Diameter of Drivers, 57 inches; Tube Length, 17 feet; Boiler Pressure, 190 pounds; Cylinders, 28x32 inches; Maximum Tractive Power, 71,200 pounds.

Because of its long rigid wheel base many railroad officials have had to eliminate the 2-10-2 type when considering more powerful locomotives.

Lateral motion driving axles and boxes were applied to the New York, Ontario & Western, 2-10-2 type locomotives to reduce the rigid wheel base to that which is in common use on Consolidation and Mikado type locomotives, and at the same time secure the advantages of the ten-coupled wheel arrangement with the resulting increased capacity of the locomotives.

Write us for further information regarding the lateral motion device.

AMERICAN LOCOMOTIVE COMPANY
30 CHURCH STREET, NEW YORK

YOU GET THE MAXIMUM OF DURABILITY FROM OUR

SEMAPHORE ENAMEL

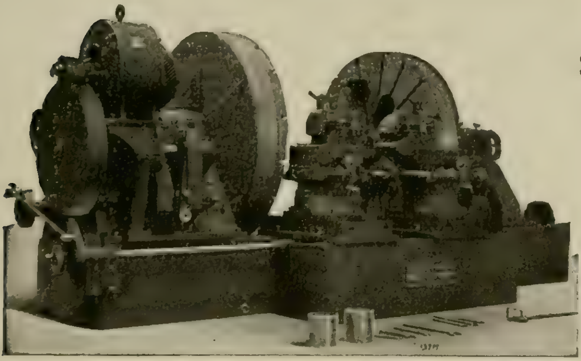
All colors—Write to us for samples.

Yarnall Paint Company
MANUFACTURERS - - - PHILADELPHIA

This Space For Sale

Railroad Repair Shop Equipment

Combining all modern features for
rapid, convenient operation.



Niles New Model Driving Wheel Lathe
Has broken all wheel shop records.

MACHINE TOOLS

STEAM HAMMERS

ELECTRIC
TRAVELING
CRANES

P. & W.
SMALL TOOLS
AND M. C. B.
GAUGES

WRITE FOR CATALOGUE

NILES-BEMENT-POND CO.

111 Broadway, New York. Pittsburgh Office, Frick Building.

---

500 RAILROAD SHOPS

Have Adopted Thermit Welding as a Standard for Frame Repairs

The list of railroads using Thermit includes practically every system from the small road having only a few locomotives to the largest system having many thousand locomotives.

The superheated liquid Thermit steel is produced in bulk and poured all at once into a mold surrounding a broken section, resulting in the perfect amalgamation of the Thermit steel with the parts with which it comes in contact. The fact that those parts are first preheated, makes the weld doubly sure.

Remember that the greatest railway systems in the world use hundreds of thousands of pounds of Thermit. They do not use it for any reason except that it "delivers the goods," and has proved itself the most profitable investment.

Full information is given in our instructive pamphlet No. 2167, "Thermit Locomotive Repairs," and shows how effectively and economically the process can be used. Send for a copy today.

GOLDSCHMIDT THERMIT COMPANY

120 BROADWAY, NEW YORK

329-333 Folsom St., San Francisco; 103 Richmond St., W.,
Toronto, Ont.; 7300 So. Chicago Ave., Chicago

THE BALDWIN LOCOMOTIVE WORKS

PHILADELPHIA, PA., U. S. A.

LOCOMOTIVES

OF EVERY DESCRIPTION

Electric Motor and Trailer Trucks

SECURITY

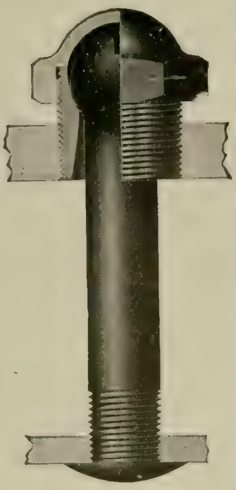
SECTIONAL ARCH

Makes staybolt inspection easy.
Saves flue troubles.
Reduces engine failures.
Easy to apply and remove.
Small brick of light weight.
Cools off quickly.
Many other good features.

AMERICAN ARCH COMPANY

30 Church Street,
New York

McCormick Building,
Chicago



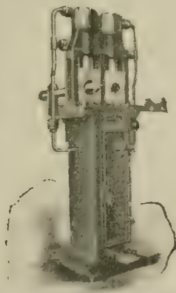
The Best Staybolt
FOR LOCOMOTIVE FIREBOXES

Railroads Are Now Using
The Tate Flexible Staybolt
At the Rate of
1,250,000 A YEAR

Our Services Are Always
At Your Command

FLANNERY BOLT CO.
Vanadium Building
PITTSBURGH, PENNA.
B. E. D. Stafford, General Manager

J. Rogers Flannery & Co.
SELLING AGENTS
Vanadium Building
PITTSBURGH, PENNA.



The Draper Manufacturing Co.
Manufacturers of
PNEUMATIC FLUE WELDERS

For Scarfing, Welding and Swedging Boiler Flues up to 4″ Diameter.

Pneumatic Tube Welding Machines for Welding and Swedging Superheater Tubes.

Flue Reclaiming Equipment used in connection with Pneumatic Flue Welders.

HUNT-SPILLER IRON
HAS THE
STRENGTH AND WEARING QUALITIES
THAT ARE ABSOLUTELY NECESSARY IN
LOCOMOTIVE CASTINGS
PRICES MODERATE RESULTS GREAT
Manufactured Only By
Hunt-Spiller Manfg. Corporation
W. B. LEACH, President and Gen'l Manager.
J. G. PLATT,
Sales Manager.
OFFICE AND WORKS:
383 DORCHESTER AVENUE
SO. BOSTON, MASS.

GALENA-SIGNAL OIL COMPANY

FRANKLIN, PENNA.

Sole manufacturers of celebrated

GALENA LUBRICANTS

PERFECTION VALVE and SIGNAL OILS

and

Galena Railway Safety Oil

Manufactured for

STEAM AND ELECTRIC RAILWAY USES EXCLUSIVELY

Guaranteed Cost **Expert Service Free**

CHARLES MILLER,
Chairman.

S. A. MEGEATH,
President.

FORT PITT MALLEABLE IRON CO.

PITTSBURGH, PENNA.

MANUFACTURING SPECIALISTS
OF MALLEABLE CASTINGS
FOR THE RAILROAD AND
CAR COMPANY TRADE.

FEATURES

Superior Quality

Expeditious Delivery

Consistent Price

INDEX—ADVERTISERS.

NAME	Page
American Arch Co.	x
American Brake Shoe & Foundry Co.	iii
American Locomotive Company	viii
Baldwin Locomotive Works	x
Ball Chemical Co.	v
Brady Brass Co.	Front Cover
Butler Drawbar Attachment Co.	xviii
Chicago Pneumatic Tool Co.	v
Davis Brake Beam Co.	xxi
Dixon, Jos., Crucible Co.	vi
Flannery Bolt Co.	xi
Fort Pitt Malleable Iron Co.	xii
Galena Signal Oil Co.	xii
General Electric Co.	xvii
Gem Manufacturing Co.	Front Cover
Goldschmidt Thermit Co.	ix
Gould Coupler Co.	ii
Graham Nut Company	Front Cover
Homestead Valve Mfg. Co.	iv
Hunt-Spiller Mfg. Co.	xi
Independent Pneumatic Tool Co.	ii
Jacobs-Shupert U. S. Fire Box Co.	xvi
Johns-Manville Co.	xix
Johnson Bronze Co.	i
Locomotive Stoker Co.	xv
Locomotive Superheater Company	Front Cover
Magnus Company	vi
Mahr Manufacturing Co.	iii
Manning, Maxwell & Moore	iii
McConway & Torley Company	xv
Nathan Manufacturing Co.	iv
National Car Wheel Co.	iii
National Malleable Castings Co.	vi
Niles-Bement Pond Co.	ix
Page Woven Wire Fence Co.	Front Cover
Peerless Rubber Mfg. Co.	vi
Pressed Steel Car Co.	xx
Railway Steel Spring Co.	xvi
Safety Car Heating & Lighting Co.	xvi
Schaefer Equipment Co.	xviii
Sipe, James B., & Co.	iv
Standard Coupler Co.	xix
Standard Steel Car Co.	xviii
Steel Car Forge Co.	Front Cover
Stucki Co., A.	xxi
Suydam, M. B. Co.	Back Cover
The T. H. Symington Co.	v
The Draper Manf'g Co.	xi
The O. & C. Co.	xxii
The U. S. Metallic Packing Co.	xvi
Union Spring & Mfg. Co.	xiv
Union Steel Casting Co.	xix
Vapor Car Heating Co., Inc.	xix
Westinghouse Air Brake Co.	vii
Westinghouse Electric & Mfg. Co.	vii
Yarnall Paint Co.	viii

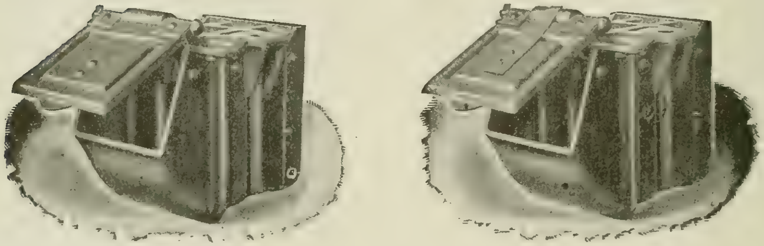
Union Spring & Manufacturing Co.

SPRINGS

Kensington All Steel Journal Boxes

PRESSED STEEL JOURNAL BOX LIDS

STEEL CASTINGS



Lightest and Strongest M. C. B. Journal Boxes Made.

WORKS:

NEW KENSINGTON, PA.

GENERAL OFFICE:

First National Bank Bldg., Pittsburgh, Pa.

NEW YORK - 50 Church Street.
CHICAGO - Fisher Building.
ST. LOUIS - Missouri Trust Building.
RICHMOND, VA., AMERICAN NATIONAL BANK BUILDING.
LOUISVILLE, KY., 42 Todd Building.

OFFICIAL PROCEEDINGS

OF

The Railway Club of Pittsburgh

Organized October 18, 1901.

Published monthly, except June, July and August, by The Railway Club of Pittsburgh, J. B. Anderson, Secretary. General Offices, Penna. R. R., Pittsburgh, Pa.

Entered as Second Class Matter February 6, 1915, at the Postoffice at Pittsburgh, under the Act of March 3, 1879.

Vol. XVI.
No. 6.

Pittsburgh, Pa., April 27, 1917.

$1.00 Per Year
20c Per Copy

OFFICERS FOR 1916—1917

President
J. G. CODE,
General Manager, Pgh. & W. Va. Ry.
Pittsburgh, Pa.

First Vice President
H.H. MAXFIELD,
Supt. Motive Power, P. R. R.,
Pittsburgh, Pa.

Second Vice President
D. M. HOWE,
Paint Expert,
Pittsburgh, Pa.

Secretary
J. B. ANDERSON,
Chief Clerk, Supt. M. P., P. R. R.,
Pittsburgh, Pa.

Treasurer
F. H. STARK,
Genl. Supt., Montour R. R.,
Coraopolis, Pa.

Executive Committee

L. H. TURNER, Supt. Motive Power, P. & L. E. R. R., Pittsburgh, Pa.
D. J. REDDING, Asst. Supt. Motive Power, P. & L. E. R. R., McKees Rocks, Pa.
F. R. McFEATTERS, Supt. Union R. R., East Pittsburgh, Pa.
A. G. MITCHELL, Supt. Monon. Div., Penna. R. R., S. S., Pittsburgh, Pa.
F. M. McNULTY, Supt. Motive Power, Monon. Conn. R. R., Pittsburgh, Pa.

Finance Committee

STEPHEN C. MASON, Secretary, The McConway & Torley Co., Pittsburgh, Pa.
E. K. CONNEELY, Asst. to Vice President, P. & L. E. R. R., Pittsburgh, Pa.
CHAS. A. LINDSTROM, Asst. to President, Pressed Steel Car Co., Pittsburgh, Pa.
L. C. BIHLER, Traffic Manager, Carnegie Steel Co., Pittsburgh, Pa.
WALTER V. TURNER, Asst. Manager,
Westinghouse Air Brake Co., Wilmerding, Pa.

Membership Committee

FRANK J. LANAHAN, President, Fort Pitt Malleable Iron Co., Pittsburgh, Pa.
A. STUCKI, Engineer, Pittsburgh, Pa.
C. O. DAMBACH, Supt., Pgh. & W. Va. Ry., Pittsburgh, Pa.
HARRY HOWE, Inspector of Castings, Pressed Steel Car Co., McKees Rocks, Pa.
R. L. KLEINE, Chief Car Inspector, P. R. R., Altoona, Pa.
B. E. D STAFFORD, General Manager, Flannery Bolt Company, Pittsburgh,Pa.
SAMUEL LYNN, Master Car Builder, P. & L. E. R. R., McKees Rocks, Pa.

Entertainment Committee

D. H. AMSBARY, District Manager, Dearborn Chemical Co., Pittsburgh, Pa.
HARRY MURDOCH, President, H. Murdoch & Co., Pittsburgh, Pa.
E. C. SATTLEY, General Manager, Page Woven Wire Fence Co., Monessen, Pa.

Past President

J. H. McCONNELL	October, 1901, to October, 1903.
L. H. TURNER	November, 1903, to October, 1905.
F. H. STARK	November, 1905, to October, 1907.
* H. W. WATTS	November, 1907, to April, 1908.
D. J. REDDING	November, 1908, to October, 1910.
F. R. McFEATTERS	November, 1910, to October, 1912.
A. G. MITCHELL	November, 1912, to October, 1914.
F. M. McNULTY	November, 1914, to October, 1916.

* Deceased.

Meetings held fourth Friday of each month, except June, July and August.

PROCEEDINGS OF MEETING, APRIL 27, 1917.

The regular monthly meeting was called to order in the Auditorium of the Commercial Club, Pittsburgh, Pa., at 8 o'clock, P. M. with President J. G. Code in the chair.

The following gentlemen registered:

MEMBERS.

Anderson, A. E.
Anderson, J. B.
Arnold, J. G.
Arnold, J. J.
Babcock, F. H.
Barth, J. W.
Beegel, F. W.
Berghane, A. L.
Blakeley, T. M.
Bradley, W. C.
Brock, Jesse
Buffington, W. P.
Burket, C. W.
Calvin, A. W.
Clark, C. C.
Cocayne, Wm.
Code, J. G.
Conner, W. P.
Cooper, F. E.
Copeland, T. T.
Courtney, D. C.
Cunningham, R. I.
Daly, P. J.
Dambach, C. O.
Forsythe, G. B.
Foster, J. S.
Freshwater, F. H.
Frey, A. R.
Fulton, A. M.
Gilg, H. F.
Grafton, N. M.
Grieve, R. E.
Haynes, J. E.
Hink, G. L.
Hoffman, C. T.
Hoffstot, H. P.
Houser, H.
Howat, C. W.
Howe, D. M.
Huchel, H. G.
Hudson, W. L.
James, R. E.
Jones, L. B.
Katzin, Wm.
Kummer, Jos. H.
Lanahan, Frank J.
Lanahan, J. S.
Lehr, H. W.
Lindstrom, C. A.
Llewelyn, W. R.
Lobez, P. L.
Long, R. M.
Lowe, W. D.
Lynn, Saml.
Lynn, Wm. Jr.
Maylock, E. A.
Mensch, E. M.
Meyer, W. J.
McCaffrey, H. A.
McConn, G. E.
McFarland, H. L.
McGhee, W. S.
McKinstry, C. H.
McNulty, F. M.
Orbin, G. N.
Orchard, Chas.
O'Connor, M.
Painter, Jos.
Parke, F. H.
Parry, F. C.
Perry, W. E.
Pratt, I. D.
Price, G. L.
Pehrson, A. K.
Rabold, W. E.
Redding, D. J.

Replogle, H. L.
Richardson, C. A.
Rodgers, R. J.
Scott, R. T.
Sewell, H. B.
Shirk, A. R.
Shorthill, R. R.
Sleeman, W. C.
Smith, C. P.
Smith, J. B.
Smithson, A. D.
Spielman, J. A.
Spindler, D. G.
Stanton, Thos.
Stark, F. H.
Stillings, W. R.
Stucki, A.
Summers, J. M.
Taylor, Jas.
Tennant, S. L.
Thurlby, A. R.
Uhler, J. L.
Von Krogh, F. F.
Walthers, G. C.
Williamson, J. A.
Zimmerman, S.

VISITORS.

Brombach, L. G.
Chipman, H.
Cotton, C. S.
Crow, N. L.
Horning, Chas.
Knight, E. A.
Marquis, E. M.
Matsunawa, S.
Maxwell, Thos.
Miller, G. H.
Moore, T. B.
Schenck, F.
Schoyer, A. M.
Sitterly, W. H.
Sneck, H.
Stenson, G. A.
Turner, W. S.
Wilkes, J. C.
Williams, A. P.
Zafra, Carlos de

The Roll Call was dispensed with, the record of attendance being had by registration cards.

The reading of the minutes was dispensed with and by consent approved as printed.

The Secretary read the following list of applicants for membership:

Durant, Chas. H., Assistant Chief Clerk to General Superintendent, B. & O. R. R., 135 Hazelwood Avenue, Pittsburgh, Pa. Recommended by J. A. Spielmann.

Duffy, John F., Pittsburgh Correspondent, Daily Metal Reporter, 1205 First National Bank Building, Pittsburgh, Pa. Recommended by C. C. Clark.

Stephenson, B. S., Resident Agent, M. A. Hanna & Co., 1445 Oliver Building, Pittsburgh, Pa. Recommended by Frank J. Lanahan.

Zafra, Carlos de, District Manager, Telautograph Corporation, 1308 Keystone Building, Pittsburgh, Pa. Recommended by J. B. Anderson.

PRESIDENT CODE: The gentlemen whose names have been read will become members upon approval by the Executive Committee and the payment of one year's dues.

Our speaker for the evening is somewhat limited as to time and he is so well known to the railroad men of Pittsburgh and to the whole country that I shall not waste time attempting to introduce him. Mr. A. M. Schoyer, Resident Vice President, Pennsylvania Lines West, to whom we now accord the floor, will address you upon the subject "Wanted, a Freight Car."

WANTED—A FREIGHT CAR.

By Mr. A. M. Schoyer.

Mr. President and Gentlemen:—I am very glad to be here tonight in dear old Pittsburgh. It is a long time since last I stood in a Railway Club meeting before you. I was a member for a long while when I lived in Pittsburgh, and I appreciate it very highly.

A great many subjects before the railroad men of today are of very great interest. You men here are largely railroad men or men so closely related to the railroad business that you can be called railroad men. So I do not know that I need to apologize for the subject I have chosen. It is perhaps one in which all the gentlemen here may not be interested, yet it is one that we all ought to know about. Of course you will understand that the subject is merely a subterfuge on which to hang the general transportation subject. I am glad to bring it before you because I think that not only individually but especially as an organization you can help along the cause a great deal.

When General Goethals was in Chicago not long ago he told a story to illustrate what I mean. He said there was a very expert stage coach driver in the west who was especially expert with his whip. One day as he was driving over the mountains he said to a small boy who was sitting beside him, "Do you see that red leaf on that tree?" Yes he saw it. "Well I will just snap it off with the whip and it will fall in the coach." So he snapped the leaf off and it did fall right into the stage coach. The boy thought it very wonderful. Then he said "Do you see that off horse there? I am going to flip him right on the left ear and he will just move his ear. Off went the whip again, and he just barely touched the horse's ear. The boy said "That is certainly wonderful." Just then they came along to a tree where there was a hornet's nest hanging, and the boy said "Mister, crack that." The driver said "My boy, a red leaf is a red leaf and a horse's ear is a horse's ear, but a hornet's nest is an organization."

An organization is a power. An individual can not do very much but an organization can do a lot. I was talking with your president at table this evening about what a power this club is and can be. The railroads of this country have passed through a very hard winter, as you all know. Not only hard because of the weather, which has been extreme, not only because of the business conditions, which have been tremendous, but it has been hard because we have been passing through a revolution insofar as the trend of the traffic is concerned. It was formerly the practice to load cars to Chicago, for instance, with coal and ore and other things that take open drop bottom gondolas and when they were unloaded they went back empty for another load. What happens today? As soon as they are unloaded one may be loaded back to the sea coast, another to somewhere in the south and another further on west, and there is no longer a system of one way loaded and back empty as formerly, consequently cars which formerly could be used and returned quickly, now take a long time to run from one place to another, it is a very long time before the car which started from the Carnegie mills loaded gets back to the Carnegie mills again loaded. That has come not only because of the change in manufacturing conditions but because in the first place the Panama Canal opened and that brought about a change in the method of shipping. Freight which formerly went to Chicago and to San Francisco in many cases went to New

York instead and was loaded on a steamer to San Francisco by way of the Canal. And just about the time that got to going nicely there was some slides in the Panama Canal and much freight had to be transshipped to San Francisco and the west coast by rail and some of it had to be unloaded on the ground waiting for the Panama Canal to reopen.

When the war started business in this country was pretty stagnant. In 1915 I had my attention especially called to the fact not only was this the fact generally, but business was not in a very healthy condition from a railroad standpoint. In fact in the srping of 1915 I remember that when going down to my office I saw a little store, the proprietor had put up a sign saying "Business is good. Business is good. By order of the President. "That was quite a joke at that time. But he followed it by prophecy, though he did not know that he was making a prophecy. I would like to call his attention to it today. His prophecy was "It will be better in 1917." And we all know it is better in 1917.

Shortly after that I was speaking in Chicago on this subject of business, and I said I divided my speech into three heads. First, prosperity, it was surely coming—for which I was laughed at. Second, facilities, they will be needed. Third, responsibility, whose is it? Who will be responsible for furnishing the facilities when the prosperity comes. It was my idea then and it is my idea now that responsibility for providing facilities in 1915 for the business of 1917 could not rest on the railroad companies. And I have not any doubt that you will all agree with me because you must be sympathetic on this particular subject. About the time the Panama Canal opened and then closed again shortly afterwards, the business of exporting to foreign countries commenced with some vigor. In 1914 this countrys exports were $750,000,000, in round figures. In the fiscal year ending June 30, 1916 the exports amounted to $2,900,000,000 or about four times as much. And for the fiscal year ending June 30, 1917 I prophecy that the exports from this country will exceed $4,000,000,000. Which means that traffic to the Atlantic sea coast increased 400 to 500 per cent.

You know what happened in the early stages of exporting under war conditions, how difficult it was to get steamers.

Steamboat rates ran up and there was not proper regulation and freight began to pile up—certain roads had to start to embargo through 1915 and 1916 and it was well on in 1916 before they were organized so as to control export shipments, that is before they got export shipments coming forward in volume as they handle it. But even today they have not gotten over the effects of that tremendous flood of business which they were not able to handle in the early stages of the war. On our railroad alone I can safely say that we have 4000 or 5000 carloads of freight on the ground and are considering the practicability of making room for 4000 or 5000 carloads more because we could not get the boats at the start and conditions have now changed and the freight must wait. Besides that I suppose there is on our lines at all times as much more freight on cars, waiting for the proper time to be put on boats. If that is so on our railroad what must it be on other railroads? At least as bad.

All this of course has resulted in a great congestion of cars, all sorts of methods to unload cars have been tried and get them into circulation again promptly. But the business continues to flow east because the outlet for business today is over the ocean to the other side.

There are in this country 2,500,000 freight cars in round numbers and there are about 235 railroads, (250 for round numbers) with about 10 freight cars in the whole country for every mile of road. The Pennsylvania owns about 30 freight cars for every mile of its road. It is one of the heavy car owners of the country, and yet with all the cars we can buy and build, and we own about 260,000 cars altogether, over one-tenth of all the cars in the country, there have been shortages of equipment of all kinds. The people wonder why that can be and they blame the railroads for it. And I believe the railroads are in a measure to blame for it, yet when all is said and done they can hardly be said to be very much to blame for the present situation. Did you ever try to walk on Fifth Avenue about six o'clock in the morning? You can go from Smithfield to Market Street very quickly, as fast as you can walk. But go down about noon or about five o'clock in the evening, the time the employees in the big stores and offices are coming out on the street, and how long will it take you? I live in Chicago and my office is on Jackson Boulevard. If I go down there early I can get from Michigan Avenue to my office in about two minutes in a motor car, but if I try to go down about 5:30 in the evening it takes me sometimes fifteen minutes to cover those two blocks because of the crowded condition of the streets. Now it has been the same way with the railroads for some time past. If all the cars in this country were placed side by side, end to end between Chicago and New York, those 2,500,000 cars would stand 19 abreast in a solid line 1000 miles long. There would seem to be enough cars to do the business of the country, and there would be if they could move. But it is no longer six o'clock in the morning with the railroads, it is 5 o'clock in the evning on Fifth Avenue. The tracks are crowded and cars cannot make the run quickly and get back but must grind along in procession and when they do finally reach their destination there are thousands of cars ahead that have to be unloaded and they have to take their turn in the slow grinding mill. Did you ever ride on a street car line where they had a nice uninterrupted run of ten blocks and the two cars on the line made it in two or three minutes? But as conditions changed they had to put on four cars to handle the people, and after a while twelve cars or 24 cars, and the more cars put on the slower was the progress. This is one of the things wrong with the street car service in Pittsburgh or Chicago or any large center, there are so many cars necessary to take the people that they can no longer move with the rapidity of former days and they are in each other's way. This is true of the railroads of this country today, they are so crowded that they cannot move their cars as rapidly as formerly and there is consequently a shortage of equipment.

Now no person could forsee this war. If any one had said in 1914 that we were to be taxed to the utmost to supply munitions, food stuffs and other things for Europe he would have been laughed at. The war at the start did not bring the conditions of prosperity that many of us thought it would bring and it was amost a year before we commenced to feel this difference. So with coal and coal prices. In the early part of the war and for a long time after the war started there was no particular increase in the price of coal. It has only been this year and in the last few months that the tremendous shortage has been felt all over the country. It is the same thing with wheat and the same with other things. It is the law of supply and demand, as there is a shortage of supply or production the price goes up, and as the price goes up so does the shortage grow, and so it continues.

With the freight car equipment of this country there has been a continuous and growing shortage. As I say, no one could have told at the beginning of the war that this shortage would be upon us as it has been. But even if we had known it we could not have been ready for it. Assuming that there are 300,000 miles of railroad in this country and that the average increase in the business of the country was about 10 per cent a year, which is probably about right, the railroads of the country should have been building about 30,000 miles of railroad a year and should have been adding about 10 per cent to their car equipment and their engine equipment every year. But we know that for three years prior to 1916 there was no railroad building and there was little car building or engine building. Why? Because the railroads had no money. The public regulates the rates and this regulation of the revenues of the railroads had reached such a stage that the railroads had not enough surplus to provide them with credit which would enable them to sell their securities and buy the necessary cars and engines and build the necessary tracks, and they had but little surplus out of their earnings for these things. Since they did not have money enough in their treasuries to buy and did not earn enough to secure credit to buy, there were consequently limited purchases, not nearly enough to take care of the average normal growth of the country, to say nothing of war conditions.

Therefore I say that the responsibility for the conditions in which the railroads find themselves today rests upon the people, that is upon you and me and all citizens, because we did not do our best to see that the railroads had what the country should give them, a proper return on their investment, with sufficient surplus to establish a credit that would enable to take care of what it is their duty to take care of, the normal growth of business in this country.

Excuse me for talking in a rather dry way but I want to try to bring it home to you. We railroad people have been criticised pretty harshly for not being in a better position. In looking over the history of the past few years, I cannot see how the railroad managements of this country as a whole could have done differently from what they have done. They did what honest man always must do, they kept within their income.

Now we are here with this enormous business on our hands. We have the business here, we all want more cars, but if we had more cars I am not sure that the railroads have the tracks to move them, and it seems to me that we not only want freight cars but we want main tracks and yard tracks and side tracks and locomotives and freight houses and we must have elevators and all the other things that go with railroads. We have got to have them all if we are going to take care of anything like the business that is upon us now. How long this business will last who can tell? How long will the war last. If you could tell that, I would not be able to tell you how long this business will continue for no man knows what conditions will be in this country when the war is over. It looks as though for a long time after the war we will have all the business this country can do.

However with the business we have upon us now, what are we going to do to take care of the business in this country? If we get the rate increase we have asked for and which I hope we will get and which the business organizations of the country are supporting splendidly, we will not be able to do more than take care of the abnormal increase in our expenses growing out of war conditions. In fact I do not know that we can quite take care of them. Take our own railroad, (it is pretty safe to say that if you multiply our experience by ten it will approximate that of the whole United States,) we figure that expenses will be increased this year about $43,000,000 by reason of the increased price of coal, materials, wages, etc. Now we cannot get coal without paying for it—cannot run engines without coal and cannot perform the duties for which railroads exist without engines. The increased price of coal ranges all the way from 60c to $1.00 a ton over last year. As compared with last year on all the railroads of the country it may be approximately $1.00 a ton more than last year. Assuming that the railroads have to pay this increased price for coal, and assuming that the increased cost of coal will be $180,000,000 which is conservative, that they have to pay the Adamson law wages, and which will add to the labor cost of the railroads of the country at least $50,000,000, and that the increased wages for the men in the shops and telegraph operators and clerks and track men and other men will add at least $60,000,000 more, and the cost of other materials will be another $100,000,000 or $110,000,000 and there is a round total of $325,000,000 increase in expenses during the year. The best figures I have been able to see anywhere for the increased earnings that will came from a 15 per cent increase in rates is about $305,000,000. If the full 15 per cent increase is granted the railroads will have about $20,000,000 less net revenue next year than in 1916. They may not get the 15 per cent increase. Anthiny less than 15 per cent will mean so much less net revenue. I do not want you gentlemen to feel that this even full 15 per cent increse will put the railroads where they can do any development at all to get ready for increased business. It will not do that at all, but it will only enable a lot of roads to keep out of bankruptcy and keep themselves about where they were last year.

But there are other ways in which we must look for an improvement in the freight car situation. What are they? A good many of them are going to come from the shipper. I do not know whether you appreciate it but I wish you would realize it and tell it to your friends and preach it wherever you go, that the shippers of this country are misusing freight cars. They are not loading them to capacity. The Pennsylvania Railroad has had a tremendous battle in this respect. The Lines East have been especially vigorous in their efforts to get people to increase their loading. Many people are taking advantage of the minimum capacity of the cars and instead of loading a car to its full capacity and 10 per cent above its marked capacity, they are loading it only to the minimum allowed by the tariffs. A car of average capacity will hold 800 bags of sugar. 400 bags of sugar is the minimum and many people are loading only 400 bags of sugar to the car. A car will hold 20,000 five pound brick. The minimum allowance per car is 10,000 brick, and many shippers are loading 10,000 brick in a car. And so it goes. On the Lines West of Pittsburgh in open top cars for instance that we load with coal or steel we find that we are only getting 81 per cent of the capacity of the car and 19 per cent is wasted. We find that in all classes of equipment, box cars, merchandise cars, and everything, we are only getting 55 per cent of the capacity of the car. Think what it would mean if the shippers would load every car to 10 per cent above marked capacity, what a tremendous increase there would be in the box car, flat car, gondola, every kind of car equipment, growing merely out of the fact that everybody put in every car all it would hold. The car will move just as rapidly and can be transported to the other end just as quickly, and all it requires is some little change in the method of selling and the insistance of the man who buys in every instance that he will get a full carload.

Another thing where the shipper can help a great deal is in not ordering more cars than he needs. Because of the tremendous shortage in car equipment there has grown up a practice in many places of ordering more cars than are needed. A shipper figures that if he orders five cars and the railroad is supplying 20 per cent of the equipment he will at least get half as many cars as he needs. Another thing which would help a great deal in the supply of cars is in the unloading of the car promptly, getting the stuff out and having the car released. In Philadelphia there was a railroad that had a yard that could hold 3800 cars. The daily unloading at that point was 1400 cars. They had to keep 3800 cars on hand all the time in order that the city should unload 1400 cars. They wanted to increase the business and they increased the capacity of the yard to 4500 cars, adding 700 to its capacity. How much do you suppose the unloading increased there? 200 cars. Instead of having 3,800 cars on hand to unload 1,400, they had 4,500 to unload 1600. They made another addition and increased their yard to 7,000 cars and the people promptly increased their unloading 200 cars more, so that instead of keeping on hand 3800 cars to unload 1400 they kept on hand 7,000 to unload 1800. The shippers of the country have not kept pace with the business of the country. They have not provided themselves with the men, the machinery, the warehouses or the tracks or anything else to keep pace with the country in unloading cars. And they have been depending on the freight cars of the country to serve as warehouses to some extent. If that is going to happen all over the country it will be impossible for the railroads ever to provide equipment enough to take care of the situation. So it will be necessary for the shippers of the country to wake up and appreciate the condition of the railroads and help.

There are many other ways in which the shippers may help the railroads increase the car capacity of the country but I think I have gone over enough to give you some idea. By loading to full capacity, by loading promptly, by only ordering such cars as are needed, by providing plenty of room to store and plenty of force to unload, and get the lading out of the cars promptly. And by cutting down the reconsigning privilege to the lowest possible point. People have to pay for reconsigning, it is true, but that does not recompense the railroads and it does not recompense the other man who cannot get the car that some one else is reconsigning. I heard of a car that was reconsigned ten times in Chicago. It was easier and cheaper to reconsign that car than to unload it and store the goods. That kind of thing is not fair to the other man and it certainly is not fair to the railroad.

I have tried to sketch through these things, but it is only by a spirit of cooperation between the men whom you meet and who are in business with you that we can meet this tremendous situation. I think we shall have it on our hands for some time. We are trying to find additional methods to improve operating conditions and transportation operation but whether that can be done I do not know. Wr. Code and myself have brown gray in the transportation business. A good many young fellows just coming up may have ways of getting cars over the road and engines running faster and handling the business better, which we never thought of. It may be so. But they will not be ready to do it for three or four years. In the next decade perhaps, and we will wonder why we never thought of it. But the men who are on the job today and the men who have worked out present methods to the best of their ability are the men who are trying to move cars and not quite succeeding and we will have to look to some one else for assistance. I think it will have to be to the public, and they must help us by sympathy and by cooperation. They must work with us and see that the railroads get revenues enough to keep them alive and let them make the improvements that must be made, and, even though it be at some inconvenience to them, they must not be selfish in the matter of loading and holding and reconsigning and demurrage. I believe if all work together, with the good weather coming it will not be very long until we will be surprised at the tremendous business we are doing. But with all that, I do not believe we will be able to do the transportation business of this country as it ought to be done in this year 1917, and a lot of people must use their best patience with the railroads and do the very least amount of criticism if we are all to work together in harmony.

There is one railroad in Chicago that has fifteen bosses, fourteen state commissions and the Interstate Commerce Commission, and it is getting orders from all fifteen of them at once as to how to distribute their equipment, how to move their trains, what to do with their rules and their rates and everything else, and it is no easy thing to serve fifteen masters, all giving orders at once, and these orders not always consistent with one another. You can not blame the bosses, for they are only in touch with their own particular bailiwick, each one trying to cover the matter from the individual standpoint. But the poor railroad is having a hard time to obey all these orders. This is working out little by little, and after while I think we shall have a more harmonious relation between all these state commissions and the Interstate Commerce Commission and their orders will be such as can easily be carried out.

We are in a transition period just now. That is one of the reasons for the present difficulties of transportation, one of the reasons why it is hard to get a car when you want it. Not long ago a friend of mine out in Chicago called me on the telephone and said "How are your passenger trains?" I told him I would rather not mention them over the telephone. He said "Neither will I mention mine over the telephone, but mine are worse than yours." Then he said "How are your freight trains? We would like to give you 10,000 loaded cars at once for New York." I said "Thank you, we have more loaded cars for New York now than we know what to do with." What a strange condition when railroads want other railroads to take business from them! Have you ever heard anything like it before? A man came to our freight representative in Chicago the other day and said "I am sorry but I just took 14 cars of freight away from you." He replied, "shake hands, take some more." How peculiar to be glad because some one has taken 14 cars of freight from you! One man said to us "If you don't move our business we will take our business away from you" and we said: "We will not move it then." Of course there is a time coming in the future when we will want that man's business badly, but during the past winter and this spring we have been so pressed with business in every direction that nobody has wanted freight who could possibly avoid taking it.

There is a little town about 60 miles from Chicago. A man shipped an automobile, he was an officer of the railroad on which the little town was located and the town was less than 60 miles on his direct railroad, and he says "Will you take an automobile shipped to this town?" I said, "It is on your own road." He said: "Yes, but we are embargoed." I said "It is not going by our railroad because we are also embargoed." Then I found that the automobile was going to that little town 60 miles from Chicago by traveling 300 miles out on the Pan Handle and away around Robin Hood's barn to get back to that little town. That situation has been true on all the railroads. They have been jammed with business. And any traffic man that could find a little hole where he could get a car in by shipping it hundreds of miles out of his way took advantage of it to get the car around to that point. You can imagine that did not help the blockade on the railroads. That was true of the past. Most of the embargoes are lifted now, but the condition that is upon us today is partially the result of that practice that has been going on all winter. We are feeling the effect of it yet

We are coming to the time of year when there will be the biggest coal tonnage and the biggest ore tonnage and the biggest steel tonnage and the biggest grain tonnage and the biggest tonnage of every other kind that this country has ever had to face and it is going to strain the nerves of every railroad man in this country to the utmost. We will have to have every engine that anybody has to run and it is not easy to get new engines today. For one thing it is pretty hard to pay for them. Engines that used to cost $25,000 cost $60,000 and in some instances $62,000 today. And cars that used to cost $1,000 now cost from $2,000 to $2,500. If we had the money we could hardly afford to load a railroad down with equipment that cost such tremendous prices and pay the interest on it for all the years after.. We will have all we can do with all the engines and cars we have today working at their very highest efficiency. And this Club, must help with all its might and main. And the way they can help is through influencing the shipper and by studying ways and means by which the equipment of this country can be increased through speed of movement, speed of handling and in heavier loading. If you will study out this problem and impress it upon your neighbors you will have done a great and lasting good for the railroads of this country. I am very much obliged to you for your attention. This has been a pretty dry sort of talk but cars are always a dry subject. I am very glad to have been here and thank you for your courteous attention.

DISCUSSION.

MR. FRANK J. LANAHAN, President, Fort Pitt Malleable Iron Co.: I feel constrained much against my wishes to take exception to some of the statements by the speaker in the comparisons used. In the first place, he spoke about conditions on Fifth Avenue at six o'clock in the morning. I should like the distinguished visitor to realize that the members of the Railway Club seldom, if ever, stay out that late.

In the second place, our visitor from Chicago refers to the fact that in Philadelphia it was necessary to increase the car storage facilities to 18,000 cars to get 7,000 properly unloaded. I think if Mr. Thorn, the self-styled railroad expert from Iowa, were to comment upon that phase of the subject he would say that he was surprised that somnambulistic Philadelphia could do so well.

The other remark to which we members of the Railway Club should feel required to take serious exception is the way in which Mr. Schoyer alludes to our very worthy president as a "gray haired gentleman", when we all in this organization know full well the pride that our executive takes in those golden sunny locks that adorn his intellectual brow. For a stranger to come in here and thus allude to this eminent gentleman who has the destinies of this Club on his head is something that none of us will stand for.

That ten thousand car story reminds me of the two Hebrew drummers who met in St. Louis:

"Ikey" said his friend Jakey, "How much bizness you think I do in Kansas City?"

"I don't know."

"Well how much you think?"

"I don't know."

"Well guess."

And Jakey said "Half."

"Half what?"

"Half what you are going to tell me."

Mr. President, outside of those discrepancies just enumerated, I think we in this organization are perfectly well satisfied with the very able address delivered by Mr. Schoyer and on behalf of the Club, I have the pleasure of moving that we extend a vote of thanks to the speaker for his very able, interesting and instructive discourse.

The motion prevailed by unanimous vote.

PRESIDENT CODE: The number of cars per mile of road is only one yard stick to measure the capacity of the proposition, and just to get a little advertising myself I will say that we have 38 cars per mile, but we haven't enough miles to make it count.

Some of the men and some of the railroads in the Pittsburgh district have done especially well in handling the business of the past year or two, and some of the gentlemen who have had to do with that are present and Mr. Schoyer has left the way open for any man to say what we are going to do about it. Mr. Spielman, what is the B. & O. doing?

MR. J. A. SPIELMANN, Assistant General Superintendent, B. & O. R. R.: I am very much pleased to be here tonight and listen to the talk on car supply. It was a most interesting and explicit statement on the subject and given in a way that we could not help but understand the speaker fully in the facts and thoughts he wished to present to us.

In line with the matter of car shortage I will say—a year ago last March there was a committee appointed in Pittsburgh by the Presidents Association of New York City (and I had the honor of being one of the Committee) to take up with all the Furnances, Rolling Mills, Foundries, etc., the matter of more prompt unloading and loading of cars, also loading cars to capacity.

We visited all the plants in Western Pennsylvania, Northern Ohio, also in Wheeling Districts. In every case we called on the President of the plant and explained fully what was coming, explaining the situation and how they could help out. I will say every one of them realized the importance and took a lively interest in the matter promising to do all they could and from the results obtained every one of these gentlemen must have gone into the matter at once and thoroughly. They responded splendidly and our efforts were rewarded to great extent. However, there was a car shortage last winter and the shortage right now is almost as great if not as great as last winter.

In regard to the Baltimore & Ohio cars will say that owing to fact that last season we had a large number of our cars put through contract shops, today the bad order cars on Baltimore & Ohio are only 2 percent, which is very good and we are making every effort to keep it down to that percentage.

The reconsigning of coal causes a great delay to cars.

I don't think there should be allowed more than one reconsignment and then a good round charge made for it. Before the Commission in Ohio a short time ago a case of a car of coal was cited when it had been reconsigned seven times and as many times switched from one point to another in Cleveland. Early this Spring there were thousands of cars of coal in Cleveland yet some of the schools were closed account of not being able to get coal, a condition brought about by speculation and reconsigning. A Railroad Official cited a case of a man who had never been in the coal business before who cleaned up $13,000. in (if I remember correctly) a week through speculation in coal.

Another delay to cars is caused by farmers and others going into the coal business, opening a little mine on the farm or getting coal out of an abandoned mine, hauling it to the railroad station and loading on cars—in some cases it is hauled by teams 3 to 4 miles. This is being done all over Western Pennsylvania, West Virginia and in Ohio, so there must be more than 1,000 cars loaded daily this way, when all these cars should go to the regular mines where they can be loaded quickly and where a larger outlay of money has been made to open and operate mines and where the car supply would be in great measure conserved and again give the miners more regular work.

Another feature regarding this matter and which just now is of vital importance. The Government is calling on every one of us to help out on the food supply, cultivate gardens, cultivate more acreage of the farms, in fact do everything that can be done to help out on the food question, yet here are 1,000 cars daily loaded by teams, delaying cars, robbing regular mines of the cars, where no teams are used to load cars. Estimating only 3 teams to a car you note there are not less than 3,000 teams at this time that should be cultivating the soil in response to the needs of our country. Is this not astonishing and should it not be stopped.

Our company has a system by which the loading is kept track of closely to see that cars are loaded up to capacity and close check is kept on the movement. It is sometimes surprising how cars loaded with company material will accumulate around terminals and shops and this is a matter we watch closely and keep punching on the unloading. These loads come in bunches and accumulate fast if not unloaded daily. There is little trouble in getting plants to unload, who are receiving 100 cars or more of material daily. Most of the trouble is with smaller plants and individuals who have little or no unloading facilities or too small storage.

PRESIDENT: Mr. Schoyer referred incidentally to the fact, and it is a fact, that we are just as short of locomotives as we are of cars and movement is handicapped in that way. Mr. Redding might tell something of the work the men responsible for the locomotives are doing and can do to help the situation.

MR. D. J. REDDING, Asst. Supt. M. P., P. & L. E. R. R.: We all know that most railroads are short of locomotives on account of the unprecendented business which we are called upon to handle and also on account of the fact that when we do put locomotives out on the road they can not get anywhere. Engines which should go over a division in five or six hours frequently consuming sixteen hours, standing somewhere because they can not get rid of their trains at terminals or on account of blockades or embargo and crowded condition of yards, etc.

It seems to me Mr. Schoyer told the story. We have not been providing facilities and the reason why we have not been providing facilities is because we did not have the money, and the reason why we did not have the money is because we could not get anybody to believe that we needed the amount of money that we did need.

Another thing which has not been spoken of very much, which is militating against the railroads now, is the shortage of labor. Take a million young men out of trade and start them to drilling and going to war, and we will be short just a million more men, and many of them will come from the railroads. It looks as though we were going to have to do the work with a million less men and we will do it because it is our duty to do it. But the railroads are not in a position to attract men for the ordinary heavy work of unloading, keeping up tracks, repairing locomotives and cars, to get the best efficiency out of them. They can not compete with the manufacturers who are getting wartime profits on their product. Some of the big newspapers in the country apparently do not realize that fact. The New York

American, the other day, objected very strenuously to the 15 percent freight increase in view of the fact that the railroads had had very large earnings during 1916. They probably never stopped to analyze operating costs. I know of one case right now of a mill president in the Youngstown district who advertises in the Youngstown papers that after May 1st, the poorest paid laborer in their employ will draw not less than $108.00 a month, and the same class of men that we have to hire at 23 cents an hour to keep up tracks and repair cars and all that sort of thing they pay 30 cents an hour. If we could pay 30 cents an hour for common labor we could keep our equipment in better condition, but the Interstate Commerce Commission will not give us the money.

I can see nothing but very strenuous times ahead for us, and all we can do is to do the best we can and exert every possible effort to get our trains over the road in minimum time and continue to embargo against all freight we can not deliver. There is no use in starting it out and blocking up your road.

PRESIDENT: There is one point that I would like to shove at you a little farther. The influence of a body of men of this kind is considerable if exerted all in the same direction. In connection with the 15 percent rate increase, even if it is granted not all the railroads will get the full benefit of it; but even if they did, I know of one just now where the increased cost of fuel represents 5 percent added to the operating ratio, that is five points above or on top of your operating ratio; with at least 2 per cent for the increased wages of the Adamson law; and anywhere from 3 to 7 percent for other increases in wages and cost of materials. You have then anywhere from 12 to 15 percent that is spent before we get it, and we have not got the 15 percent increase yet. You can see what that means and how little the 15 percent increase would give toward additional capital for yards and other facilities.

Mr. W. H. Sitterly, Vice-President of the Central Railway Club of Buffalo, is present and we would like to hear from him.

MR. W. H. SITTERLY: Mr. President, I did not come prepared to talk on this subject and I do not know that I can add anything to what the former speakers have said. I do believe that railroad facilities today and the development of business that we have to handle are a good deal like the Irishman, if I may tell a story. A priest desired to have the ground about the church cleaned up on account of the ladies wanting to hold a lawn fete, so he called one of his parishioners and said to him "Pat, you clean up around the church and I will pay you for it and in addition I will give you a drink of liquor and let you pour it out yourself." Pat did the job and the priest paid him for it. Then he said "Come in and I will give you the glass of whiskey I promised you and I will let you pour it out." He gave Pat the bottle of whiskey and a glass and Pat stood there with the bottle in one hand and the glass in the other and made no move. Finally the priest said "Pat, why don't you drink?" He said "Father I was just wondering how did they make that glass." And the priest said "They blow them" the same as they do bottles." Pat said "Did a man blow that glass?" and he said "Yes." "Father," Pat replied, "the fellow that blew that glass was mighty short of wind."

The railrads are short of cars and tracks and they are short of a great many other things and the expense that is assessed against the railroads by various legislation hampers them a great deal more than the layman really knows.

I was very much interested in Mr. Schoyer's remarks and I think they were proper and to the point.

MR. H. F. GILG, Representative Penn Iron & Steel Co.: At our mill, in order to keep men working, we are paying 27½ cents an hour and the men are making so much money at that rate that they think they ought to take a day or two off a week. In order to get them to work six days a week we have been compelled to give them an extra day for each two weeks, thirteen days for two weeks work if they don't lose any time. Some few years ago when I was in the Connellsville region the miners could make $5.00 a day working in the mines perhaps six hours a day. A little spurt came in and one of the superintendents wanted a little extra work done. The miners were not working full time. I asked him if he could get the miners to work a full week and he illustrated the fact that he could not by calling a man across the street from the company store. "Mike will you work six days this week?" "No, three days is enough to keep me." If we have that condition we are only getting half the work the man can do and the man who does that is not doing honest work for himself, his family or his employer. If there is any way that can be devised to get a man to do his full day's work the question would be solved. But it is impossible to do that unless we revise our methods of education. I think our educational institutions are not teaching in the right direction. I have thought of that very seriously for many years because in my youthful days I taught school for three winters. The principles I taught were honesty, fidelity and the principles of liberty. I think those principles have been lost sight of in trying to make our schools into universities instead of teaching the fundamental principles that every boy and every girl should be honest. And if every man that is working for a living today were honest we would have better conditions.

MR. D. G. SPINDLER, Engineer, Union R. R.: Speaking about the efficiency of labor on the railroads it seems to me efficiency went down when this boom came on, in other words since the job is hunting the man instead of the man hunting the job. And we will have less efficiency as long as that condition continues. Some railroad men if you use efficiency on them, say they will go over to the Lake Erie, and from the Lake Erie they go to the B. & O. And the common laborers on the railroad you will never keep them as long as the mills are paying 11 hours and the railroads paying 10 hours. In my judgment efficiency will be increased only when the man hunts the job.

MR. C. O. DAMBACH, Superintendent, P. & W. Va. Ry.: I did not come here to talk, but since I am on my feet I will say that I think that one remark made by Mr. Schoyer which was not touched on by the other speakers opens up a wonderful field, the subject of cooperation. In the Pittsburgh territory there are hundreds of people shipping coal to the lakes and all holding cars until they get enough to load a boat. It is all practically the same kind of coal. Last year we started to get these coal operators to help us by dumping in everybody's coal in one boat, instead of holding thousands of cars for different boats, and by this means we got it down from several thousands to a few hundreds of cars being held at a time. That is one thing that can be accomplished by cooperation. And there are a lot of other ways where we could speed up car supply. We had practically 100 percent car supply last season due entirely to getting the shippers to cooperate.

As to embargoes, there is no reason why a man should have a lot of coal on the track when he can't dispose of it. I have on my desk now a letter from a man who claimed that he could not get coal. I sent out an investigator and learned that he had lots of coal and is peddling his coal out to dealers in small lots at high prices. He has all the coal he can get hold of. Another man in Cleveland had a desk in a hall-way, one of those $13,000 a week fellows, and he had 56 of our cars on hand for five weeks, some of them reconsigned a good many times. He was paying a little demurrage but he could pay $1.00 a day or $5.00 a day demurrage when coal was jumping $1.00 a ton. We got after him and he unloaded the cars. He was depriving other people of cars and putting the price up. If the shippers will work it out to overcome some of those things there will be lots of cars.

MR. SPIELMANN: I will second Mr. Dambach's remarks. We hold at one of our ports on the Lake several thousand cars of coal constantly during navigation, account of the large number of shippers and consequently many classifications of coal, there being something like 40 classifications.

Some of the shippers traded off with others last season and will do the same this season. If all coal from the same vein could be pooled and shippers from all veins do the same it would relieve the necessity of holding so many loaded cars at the port. I understand there are 70,000,000 tons of ore to come down over the Lakes this season and this with the enormous tonnage of coal to go up over the Lakes will make strenuous work for the railroads this season. It is a matter of unloading and loading quicker by the shipper and speeding up on car mileage that will solve the question and I believe each one of us can do his bit in this work.

MR. LANAHAN: Judging from the remarks that have been made a lot of difficulties confront the railroads, but do not imagine that the manufacturing business these days is a Utopia where you have all the labor and every facility you might wish for. Just to enlighten you railroad fellows who are not acquainted with the facts, it can truthfully be said that your troubles are not much greater than those in the manufacturing business today. We are all in the same boat and you who are in the stores department of the railroads know well the troubles the manufacturers are having in making deliveries, and the vast quantity of materials you had a right to expect months ago which has not as yet been delivered. Tonight in enumerating the difficulties, we have barely scratched the surface of industrial unrest and only the extreme high spots of the antagonisms that are confronting the industries of the country have been mentioned. This includes transportation as well as general manufacturing. One of our speakers, the Vice President of the Railway Club of Buffalo, referred in his humorous story to the lack of capacity in blowing glass. There are many employers who wish there was a greater lack of capacity on the part of the fellows who insist on the daily use of that glass as a finished product. None doubt, I feel sure, that if men were more temperate in this respect, we would have far more efficiency and contentment not alone in the transportation line, but in manufacturing as well.

There is some question in the minds of thinking men all over the country whether one of the prime causes of unrest and inefficiency today is not due to the co-operation between what might be termed the illegitimate labor element, and the bait offering politician. It is a union that is absolutely a detriment to the country. It is not alone apparent in the States legislatures, and every local law-making body, but it is to be also seen in Washington. No aspersion is meant on honestly conducted labor unions nor high minded conscientuous statesmen, but those parasites, that debase themselves by securing their living by the injustice they practice on their associates, and with mercenary motives make dupes of well meaning but misguided honest co-workers in the enactment of such legislation as is detrimental to the welfare of the community as a whole. The obnoxious union of these degenerates is not alone apparent in the various legislatures in many of the States, but to our eternal shame it is plainly visible in both the House and Senate at our National Capitol. It abounds in local politics and extends in its various ramifications to the remotest corner of our political existence. Manifest is it constantly in unfair taxation, unjust regulations and scandulous discrimination.

The question is "Where is it going to end?" Evidence of its painful influence is found in the passage by a great many of the States of that odius legislation known as the "Full Crew Law." In this hour of national apprehension when every right minded citizen is desirous of conserving the country's resources, we have a flagrant example of inefficiency in this extra man law.

There is not any unprejudiced man living who has given any thought to this subject, but knows that to make mandatory the carrying of an additional brakeman on every train, is a serious blunder; the public service commission should be clothed with discretionary power to decide whether or not an extra man is needed on any train, and if in their judgment, after proper investigation, it is deemed wise, issue their mandates accordingly. Today when every railroad man in United States is begging for any kind of help to meet the increasing demands of the public, it is most galling to see a lot of trainmen going back and forward over the road simply as ornaments and not doing a solitary thing to earn the wages that they receive. How helpful would be these men's service in other channels. What are we going to do about it? The development of efficiency in our various organizations is a question for each concern to handle for itself, but it is something that we must get, for the problem sooner or later has to be solved. The political proposition is something that can be handled by the people themselves in the selection of proper candidates. Do not come to meetings such as this, or go to civic organizations and prate of your patriotism if you are not registered or if you do not vote. The man who does not register and who does not cast his ballot for some candidate is the fellow in a gathering of this kind, when a subject of legislation is under discussion, who should hide his head in shame. I will not embarrass any of the men in this assemblage by asking if they have performed their duty as citizens by registering and voting, but the man who has not, must feel the consciousness that he had failed to do his duty not only to himself and neighbors, but his country as well. Organizations of this kind, where railroad men and manufacturers, important transportation executives and little-known-railroad-workers, recognized captains of industry and their loyal employes, meet on the same footing and freely discuss these important questions with a common understanding, generating a spirit of co-operation, are the things that will go a long way toward solving the problem. And until men do look at it in that way, we will be floundering in the mire in matters of transportation as well as manufacturing.

MR. REDDING: I would like to make a suggestion. Several men in the transportation department have spoken about the pooling of coal shipped to the lakes. Present methods are not conducive to rapid unloading of cars. It would seem possible to pool the shipments the same as the cattle men in the west. In the big ranges of the west when cattle men go out to round up cattle, they may round up a thousand head and ship them to market, and the organization there sorts them out, and the owner of some of those cattle may never know that his cattle have gone to market until he gets the check from the stock yards telling him that so many cattle bearing his brand have been turned in and giving him the price. It would seem possible to make that sort of arrangement in shipping coal. And it seems to me the organization to do that sort of thing would properly be the Chamber of Commerce and I believe it would be very good work for the President of this Club as manager of a railroad, to take that matter up with the other railroads in the Pittsburgh district and that the Chamber of Commerce or some other suitable body try to prevail on the manufacturers to establish some sort of pooling arrangement or clearing house at the lake ports where coal is shipped this year, whereby any car of coal of practically the same grade coming to that harbor would be loaded into the first boat that is empty going to the port that is the destination of the coal, and that it be not held for an accumulation from that particular mine. If that could be done it would go a long way toward releasing a lot of cars to bring this tremendous lot of ore back into this territory that is necessary to keep the business going.

PRESIDENT: I will be very glad to help in any movement of that kind. We have in one district last year pooled the coal and with good results in the release of equipment. It is not possible to pool coal from different districts, for example No. 8 Ohio can not well be pooled with Youghiougheny coal. There is a real difference in quality and in the uses to which it is put at destination. The results we have had in the pooling proposition have been accomplished by co-operation with the shippers of the particular district.

The question was up last year at a meeting of railway executives and coal shippers called by Mr. Peck of the Pennsylvania Lines and the difficulty in handling it at that kind of a meeting was the various interests which could not be brought into a pool. I believe, however, that the pooling proposition can be pushed farther than it has been and it can be done in districts where it has not been done before and it will be an important element in producing car efficiency and an adequate car supply. If anything can be done through the Chamber of Commerce to help it along I will be glad to get it in there.

MR. LANAHAN: It may be interesting to the members of the Railway Club of Pittsburgh to know that the Chamber of Commerce of Pittsburgh has within the past week unanimously passed a resolution recommending to the Interstate Commerce Commission that the increase in rates for the railroads as now applied for in Washington, be granted. This resolution was not passed by the Board alone, but by the entire membership of that important body representing all classes of citizens and all kinds of business, and passed without a dissenting vote. If in your wisdom you deem the matter under discussion should come up before the Chamber of Commerce, I think you realize that you have sufficient friends in that body to put the matter before the Board and then to the membership for action, and it is so eminently fair, you will have no difficulty in having the matter passed.

PRESIDENT: Is there any further discussion? If not a motion to adjourn will be in order.

On MOTION, Adjourned.

J. B. Anderson
Secretary.

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT CONGRESS OF AUGUST 24, 1912,

Of Official Proceedings—The Railway Club of Pittsburgh published monthly, except June, July and August at Pittsburgh, Pennsylvania, for April 1, 1917.

County of Allegheny,
State of Pennsylvania, } *ss.*

Before me, a Notary Public in and for the State and county aforesaid, personally appeared J. B. Anderson, Secretary, who, having been duly sworn according to law, deposes and says that he is the editor and Publisher of the Official Proceedings—The Railway Club of Pittsburgh, and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 443, Postal Laws and Regulations, printed on the reverse of this form, to-wit:

1. That the names and addresses of the publisher, editor, managaing editor, and business managers are:

Publisher, J. B. Anderson, Secretary, 207 Pennsylvania Station, Pittsburgh, Pa.

Editor, J. B. Anderson, Secretary, 207 Pennsylvania Station, Pittsburgh, Pa.

Managing Editor, (None).

Business Managers, (None).

2. That the owners are: (Give names and addresses of individual owners, or, if a corporation, give its name and the names and addresses of stockholders owning or holding 1 per cent or more of the total amount of stock.)

The Railway Club of Pittsburgh, 207 Pennsylvania Station, Pittsburgh, Pa.; President J. G. Code, General Manager, Wabash-Pittsburgh Terminal Railway, Pittsburgh, Pa.; Secretary, J. B. Anderson, Chief Clerk to Superintendent Motive

Power, Pennsylvania Railroad, Pittsburgh, Pa.; Treasurer, F. H. Stark, General Superintendent, Montour R. R., Coraopolis, Pa.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state.)

(None)

J. B. ANDERSON,
Signature of editor, publisher.

Sworn to and subscribed before me this 31st day of March, 1917.

F. D. ECKER,
[SEAL] *Notary Public.*

My commission expires January 15, 1921.

RAILWAY CLUB NOTES.

The following subjects were presented and discussed by the several Railway Clubs during the month of April, 1917, as noted below:

New York Railroad Club, Harry D. Vought, Secretary,
95 Liberty Street, New York, N. Y.

SUBJECT—"Railway Water Supply" by C. R. Knowles.

New England Railroad Club, Wm. E. Cade, Jr., Secretary,
683 Atlantic Avenue, Boston, Mass.

SUBJECT—"Stephenson and Transportation" by F. E. Stanley.

Canadian Railway Club, Jas. Powell, Secretary,
P. O. Box 7, St. Lambert, near Montreal, Can.

SUBJECT—"Railway Operating Efficiency as Influenced by Material and Supply Accounts" by W. E. Symons.

Richmond Railway Club, F. O. Robinson, Sec'y, Richmond, Va.

SUBJECT—"Illustrated Lecture on London" by A. B. Clarke.

St. Louis Railway Club, B. W. Frauenthal, Secretary,
Union Station, St. Louis, Mo.

SUBJECT—"Freight Car Situation and Its Probable Solution" by J. A. Somerville.

Southern & South Western Ry. Club, A. J. Merrill, Secretary,
Box 1205, Atlanta, Ga.

SUBJECT—Unknown.

Central Railway Club Buffalo, N. Y., Harry D. Vought,
Secretary, 95 Liberty Street, New York, N. Y.

SUBJECT—No Meetineg.

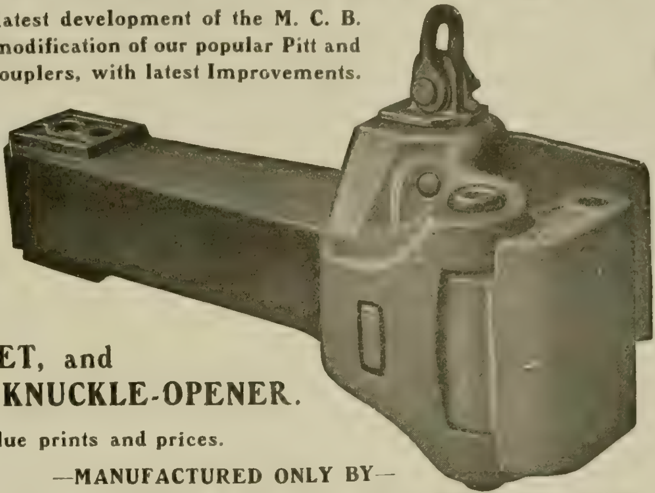
The Railway Club of Pittsburgh, J. B. Anderson, Secretary,
207 Penna. Station, Pittsburgh, Pa.

SUBJECT—"Wanted—A Freight Car" by A. M. Schoyer.

Copies of the above papers can be had upon application to the Secretary at the address given for a nominal price.

THE PENN COUPLER

Our latest development of the M. C. B. Coupler, a modification of our popular Pitt and Janney X Couplers, with latest Improvements.



LOCK-
TO-
THE-
LOCK,

LOCK-SET, and
KNUCKLE-OPENER.

Send for blue prints and prices.

—MANUFACTURED ONLY BY—

THE McCONWAY & TORLEY CO.,
PITTSBURGH, PA.

Our Best Salesman!

Any of the over FORTY Railroad Systems in the United States using our STREET STOKERS and MECHANICAL COAL PUSHERS.

LOCOMOTIVE STOKER CO.

General Office and Works
PITTSBURGH

50 Church Street
NEW YORK CITY

Railway Exchange
CHICAGO

PINTSCH MANTLE LIGHT

The system that has made good wherever it has been applied . . . .

SAFETY ELECTRIC LIGHT

Type "F" regulation ensures constant lamp voltage and long lamp life .

The Safety Car Heating & Lighting Co.

Chicago, Philadelphia, Washington, Boston,
St. Louis, San Francisco, Montreal

2 Rector St., New York

KING METALLIC PACKINGS

for Locomotive Piston Rods, Valve Stems & Air Pumps

SECURITY WRIST PIN
LEACH SANDERS
GOLLMAR BELL RINGER
INDESTRUCTIBLE OIL CUP
BRAIDED SWAB, ETC.

The U. S. Metallic Packing Co.
PHILADELPHIA

FIREBOX FACTS

1. Big locomotives have long wheel bases.
2. Long wheel bases must be covered by long boilers.
3. Long boilers mean excessive flue lengths.
4. Excessive flue lengths represent investment in heating surfaces of low evaporative values.
5. Shorter flues mean longer fire boxes.
6. Longer fire boxes (with combustion chambers) of the radial stay type are dangerous and introduce added stay bolt troubles.
7. The Jacobs-Shupert sectional fire box (and combustion chamber when required) supplies the means for designing locomotive boilers of correct economic proportions and at the same time for reducing maintenance problems to a minimum.

"YOURS FOR BETTER BOILERS"

Jacobs-Shupert U. S. Firebox Co.

30 Church St., New York. Works: Coatesville, Pa.

RAILWAY STEEL-SPRING COMPANY,

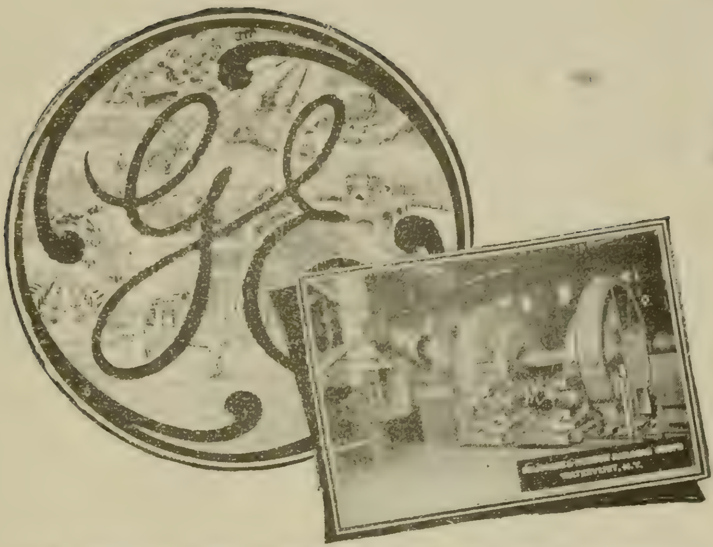
Springs,

Steel Tired Wheels,

Locomotive and Car Wheel Tires.

GENERAL OFFICE, 30 CHURCH STREET, NEW YORK

BRANCH OFFICES:—CHICAGO, ST. LOUIS. ST. PAUL, WASHINGTON, D. C.



G-E Motors and Control Increase Production and Reduce Maintenance

Inevitably — you will electrify

SOONER or later the advantages of G-E MOTOR DRIVE are going to become so apparent to you that you will ask our Engineering Organization to study the conditions and requirements of your plant—just as the owners of the equipment here illustrated had us do.

Because of its wide experience in *all* fields of industrial power, the General Electric Company can apply to the solution of *your* power problems a breadth of experience and knowledge to which no other institution can lay claim. Furthermore, the organization and resources of the General Electric Company stand squarely behind every G-E MOTOR DRIVE to insure satisfactory operation.

G-E Motor Drive

GENERAL ELECTRIC COMPANY

General Office, Schenectady N.Y. Sales Offices in all large cities

6804

STANDARD STEEL CAR COMPANY

OFFICES
General Offices: Frick Bldg., PITTSBURGH, PA.
NEW YORK: 170 Broadway
CHICAGO: Fisher Building

WORKS
BUTLER, PA.
NEW CASTLE, PA.
HAMMOND, IND.

STEEL AND COMPOSITE

FREIGHT CARS

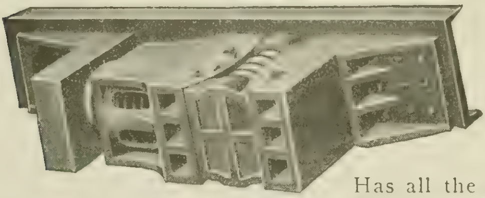
For all Classes of Service, from our Standard Designs,
or according to Specifications of Purchasers.

Steel Car Underframes

TRUCKS, BOLSTERS, BRAKE BEAMS, ETC.

Capacity 50,000 Cars per Annum

INQUIRIES SOLICITED



USE BUTLER DRAFT GEARS

FRICTION RIGGING

PIPER PATENTS

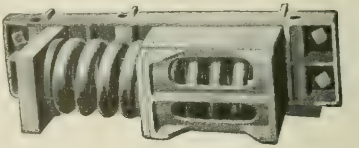
200,000 lbs. Capacity.

Has all the points of a Perfect Gear.

TANDEM SPRING ATTACHMENTS

6¼x8 or 8x8 DRAFT SPRINGS

PERFECT SPRING PROTECTION



Butler Drawbar Attachment Co.

Send for Catalog CLEVELAND, OHIO

SCHAEFER

DROP-FORGED

FOUNDATION BRAKE GEAR DETAILS,

COMBINE

MORE STRENGTH WITH LESS WEIGHT

Schaefer Equipment Company

Oliver Building Pittsburgh, Pa.

STANDARD STEEL PLATFORMS

ARE IN USE BY 281 COMPANIES

SESSIONS—STANDARD FRICTION DRAFT GEARS

ARE IN USE BY 205 COMPANIES

—BOTH MADE BY—

THE STANDARD COUPLER CO.

CHICAGO: People's Gas Building NEW YORK: 30 Church St.

J-M RAILROAD SUPPLIES

Roofings
Packings
Gaskets
Pipe Coverings
Hair Felt
Smoke Jacks
Asbestos Wood
Waterproofing
Corks

Fibre Conduit
Locomotive Lagging
Flexible Armored Squirt, Tank, Car Heating, Air Brake and Air Signal Hose
Air Brake Expander Ring
Steel Car Insulation
Underground Conduit
Asbestos Cements

Brake Lining and Blocks
Electrical Supplies
Mastic Flooring
Speedometers
Fire Extinguishers
Manual Slack Take Up for Air Brakes
Vitribestos Stack Lining
Refrigerator Car Insulation

Write for Catalogs

H. W. JOHNS-MANVILLE COMPANY

NEW YORK CITY
Branches in 54 Large Cities

Union Steel Casting Company,

PITTSBURGH, PA.

Steel Cast Locomotive Frames, Driving Wheel Centers, and Miscellaneous Locomotive Castings.

Vanadium Steel Castings a Specialty

VAPOR CAR HEATING CO., Inc.

RAILWAY EXCHANGE CHICAGO

Successors to

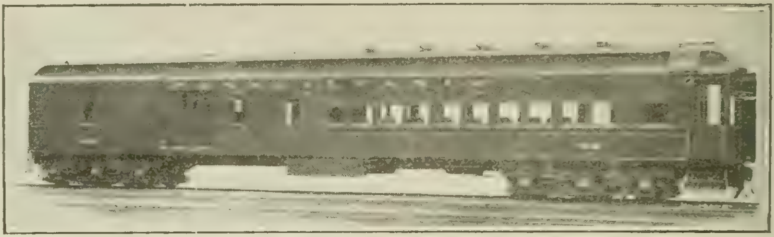
Chicago Car Heating Co.

Standard Heat & Ventilation Co., Inc.

NEW YORK
30 Church
WASHINGTON, D. C.
Munsey Bldg.

Montreal,
Que.

BOSTON, MASS.,
53 State Street
ATLANTA, GA.,
Candler Bldg.



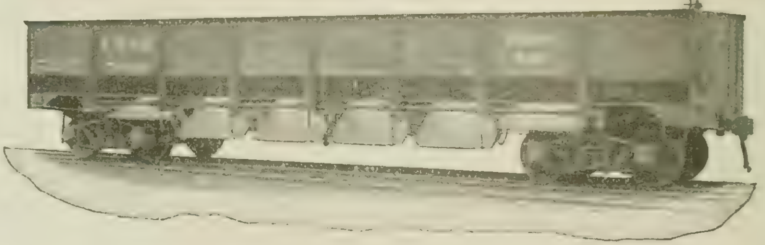
Freight and Passenger
CARS
Of Every Description

Pressed Steel Specialties

Tank Cars Mine Cars

Pressed Steel
Car
Company

New York Pittsburgh Chicago St. Paul



FOR

GREATER EFFICIENCY

USE

DAVIS **SOLID-TRUSS** BRAKE BEAMS

FOR

Freight and Passenger Equipment.

ALSO

Pressed Steel Journal Box Lids.

DAVIS BRAKE BEAM CO.,

JOHNSTOWN, PA.

FRANK J. LANAHAN, Pres. CHAS. J. GRAHAM, Vice-Pres. H. L. REPLOGLE, Gen'l. Sales Rep

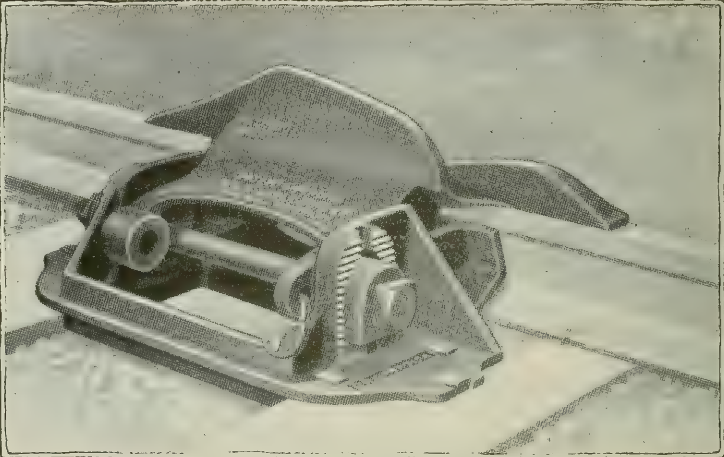
---

STUCKI
Side Bearings

SAVE WHEELS, RAILS, POWER
AVOID DERAILMENTS

A. Stucki Co.
Oliver Building
PITTSBURGH,
PA.

This Space For Sale



Adjustable for 70 to 100 lb. Rails—

and without adzing the ties. That is the one big feature of Q & C 8XX Derail. It eliminates the necessity of carrying in stock an assortment of derails for various height of rails.

Made extra long, positive derailment is assured. Damage to the derail by the derailment is eliminated, as the wheel falls clear of the derail. Made in rights and lefts, they can be applied at any point---easily being installed by one man in five minutes time.

Q & C Derails installed at every freight track turnout will soon prove an economical investment.

Made in various sizes and types. Send for complete literature on Q & C Derails.

The Q AND C Co.

NEW YORK
90 West Street

ST. LOUIS
Railway Exchange Bldg.

CHICAGO
Peoples' Gas Bldg.

The Q AND C DERAIL

SUYDAM'S Protective PAINTS
For Freight Cars and Structural Steel Work
MANUFACTURED BY
M. B. SUYDAM COMPANY,
OFFICE AND WORKS, 61ST AND BUTLER STS.,
BELL 'PHONE, 343 FISK.
PITTSBURGH, PA

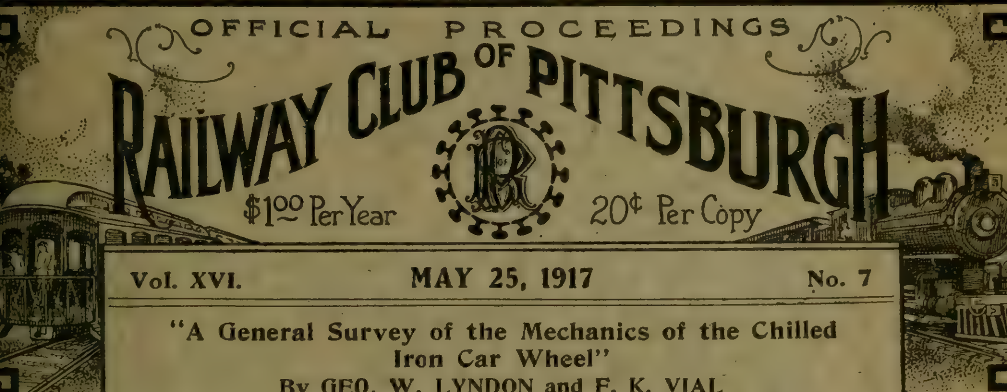
This Space For Sale.

Carnegie Library
of Pittsburgh

FOR SALE

BRADY BRASS CO.
MANUFACTURERS OF
CYPRUS BRONZE FOR LOCOMOTIVE and CAR BEARING USE
ENGINE CASTINGS BABBITT METALS
JOURNAL BEARINGS MOTOR BEARINGS
General Office and Works, 170-182 Fourteenth St. and 169-175 Fifteenth St., Jersey City, N. J.
DANIEL M. BRADY, PRESIDENT

TYPE A SUPERHEATER LOCOMOTIVES
Make firing easier Save coal and water
Haul longer trains Maintain faster schedules
LOCOMOTIVE SUPERHEATER COMPANY
30 Church St., New York. Peoples Gas Bldg., Chicago.



OFFICIAL PROCEEDINGS
RAILWAY CLUB OF PITTSBURGH
$1.00 Per Year 20¢ Per Copy

Vol. XVI. MAY 25, 1917 No. 7

"A General Survey of the Mechanics of the Chilled Iron Car Wheel"

By GEO. W. LYNDON and F. K. VIAL

TURN BUCKLES
STEEL CAR FORGE COMPANY
"FORGING SPECIALISTS"
PITTSBURGH NEW YORK CHICAGO

FOR SALE

ARISTOS
Electrical Uses "COPPERWELD" Mechanical Uses
A COPPER CLAD STEEL WIRE
Product of the COPPER CLAD STEEL CO., Pittsburgh, Pa.
Drawn and Sold Exclusively by
PAGE WOVEN WIRE FENCE CO., - - Monessen, Pa.

FOR SALE

TORCHES

Gem Torches Save You Money

Exhaustive tests by largest railway systems have proven that Gem Brazed Seam Torches do save money. Let us prove it. Send for free sample and information.

Gem Manufacturing Company
PITTSBURGH, PA.

Graham Nut Company

PITTSBURGH, PA.

MANUFACTURERS OF

Hot Pressed Nuts, Cold Punched C. & T. Nuts
Bolts, Lag Screws, Washers, Etc

This Space For Sale

"Same Old Face!"

Well you see, boys it's the only one I ever had:

And it's served me pretty well. In fact I know of only ONE thing that has a service record anything like as good, and that's a

JOHNSON

loco. bearing. You've tried all the others maybe — had your troubles with 'em too. Why not give MY pets a chance NOW?

What say?

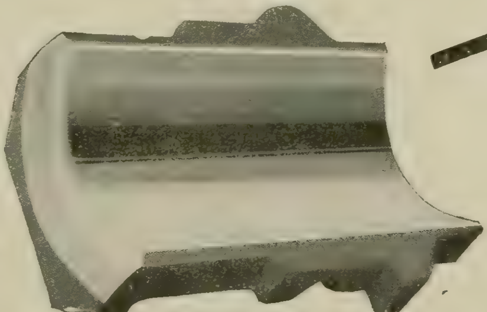
Then write

JOHNSON BRONZE COMPANY

New Castle, Pa.

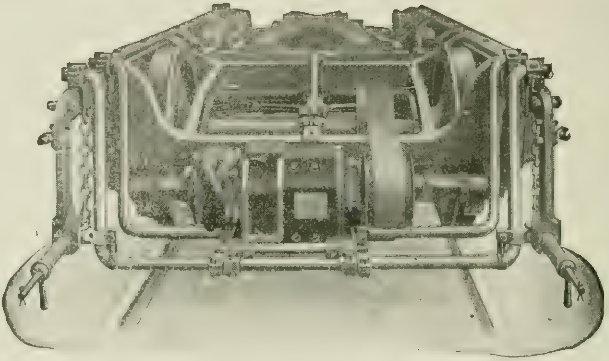
Sales Offices: New York, Buffalo, Cleveland, Cincinnati, Detroit
Chicago, San Francisco

We also make all styles and sizes of BRONZE BUSHINGS



THE GOULD "SIMPLEX" SYSTEM OF

ELECTRIC CAR LIGHTING

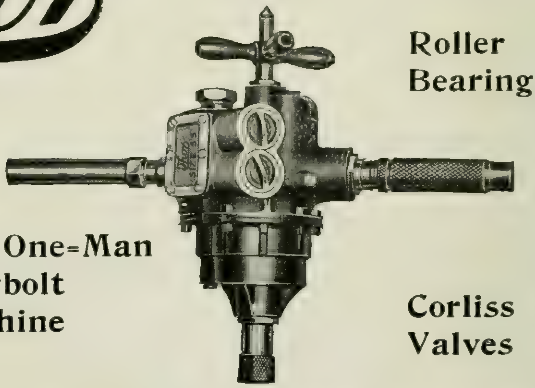


GOULD COUPLER CO.

NEW YORK

Thor

Roller-Bearing Compound
Piston Air Drills



Roller
Bearings

No. 32
L

The One=Man
Staybolt
Machine

Corliss
Valves

FURNISHED ON TRIAL FREE. WRITE NEAREST BRANCH

INDEPENDENT PNEUMATIC TOOL COMPANY

Chicago : New York : Pittsburgh : Detroit : San Francisco : Birmingham : Montreal, Que.

MANNING, MAXWELL & MOORE,

ROBT. A. BOLE, MANAGER, PITTSBURGH BRANCH

PARK BUILDING

LONG DISTANCE TELEPHONE CALL. GRANT 67

Railway and Machinists' Tools and Supplies, Electric Traveling Cranes, Compressors, Pneumatic Hoists, Riveters and complete Machine Shop and Foundry Equipment

NATIONAL CAR WHEEL COMPANY

MANUFACTURERS OF

"STAR SPECIAL"

Reg. U. S. Patt. Off.

CHILLED CAST IRON CAR WHEELS

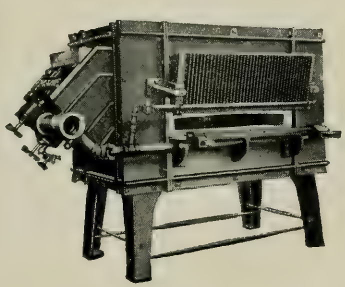
WORKS:
Rochester, N. Y. Pittsburgh, Pa.
Sayre, Pa. Cleveland, O.
New York City, N. Y.

General Offices:
PITTSBURGH, PA
New York Office:
556 WEST 34th STREET
Phila. Office:
506 FRANKLIN BANK BLDG.

BRAKE SHOES

AMERICAN BRAKE SHOE
& FOUNDRY COMPANY

30 Church St., New York
322 So. Michigan Ave., Chicago
Chattanooga, Tenn.



Mahr Oil Furnaces

FOR

Annealing, Forging, Flanging and General Industrial Heating

Mahr Manufacturing Co.

Minneapolis

NATHAN MANUFACTURING CO.
Amity and Lawrence Streets
FLUSHING, LONG ISLAND, N. Y.
1612 Old Colony Building, Chicago.

Monitor, Simplex and Nathan Injectors for Locomotives
AND
Sight-Feed Lubricators.

All Specially arranged for High-Pressure Engines.

STEAM FIRE EXTINGUISHERS FOR SWITCHING AND YARD ENGINES.

Boiler Washers, Boiler Testers, Rod and Guide Oil Cups, Etc.

— SOLE AGENCY FOR THE —

Coale Muffler & Safety Valve Co., Inc.

SIPE'S No JAPAN OIL TRADE MARK REGISTERED J.B. SIPE & CO. MANUFACTURERS. ALLEGHENY, PA.

ESTABLISHED 1884

SIPE'S JAPAN OIL

"STRENGTHENS, DRIES, AND WATERPROOFS;
Add Sipe's Japan Oil And Improve the Paint".

IN DAILY USE BY ALL THE LEADING RAILROADS IN THE UNITED STATES

MANUFACTURED ONLY BY

CHICAGO ILL. **JAMES B. SIPE & CO.** PITTSBURGH, PA.

LOCOMOTIVE BLOW-OFF
DOES SATISFACTORY WORK ON MANY ROADS.

Can be worked from cab or foot board while running.

A catalog or call by Representative for the asking.

Homestead Valve Mfg. Co.,
Works: Homestead, Pittsburgh, Pa.

=: FARLOW DRAFT ATTACHMENT :=

For { TWIN M. C. B. DRAFT SPRINGS
OR
FRICTION DRAFT GEARS

THE T. H. SYMINGTON CO.

New York Chicago Baltimore Rochester

BALL'S
VARNISH REMOVER

OXOLIN
REGISTERED
THE IDEAL PAINT OIL

B. C.
SPIRITS

Ball Chemical Co.

CHICAGO Office,
63 W. Van Buren Street.

Fulton Bldg., PITTSBURGH, PA.

Logical Construction
is a feature of
BOYER
Pneumatic Hammers

No. 80X Boyer Riveting Hammer. Capacity 1⅜ inches.
Length overall only 21⅜ inches.

Boyer Hammers are made in three parts, cylinder, handle and valve—a construction which facilitates examination, cleaning and repairs, and extends the life of the tool indefinitely.

Write for Hammer Bulletin 124.

CHICAGO PNEUMATIC TOOL CO.

PITTSBURGH: 10 and 12 Wood St

1052 Fisher Bldg.
CHICAGO

Branches Everywhere

52 Vanderbilt Ave.
NEW YORK

H. H. HEWITT, PRESIDENT. W. H. CROFT, VICE-PRESIDENT

MAGNUS METAL

MEETS ALL HIGH-GRADE REQUIREMENTS.

IT IS THE STANDARD METAL

FOR LOCOMOTIVE WEARING PARTS,

JOURNAL BEARINGS FOR { FAST PASSENGER CAR SERVICE, HEAVY FREIGHT CAR SERVICE.

MAGNUS COMPANY

111 BROADWAY, NEW YORK.

DURABILITY COUNTS

DIXON'S SILICA GRAPHITE PAINT

is the "LONGEST SERVICE" paint. Recommended and largely used as standard by railroad economists, and engineers, throughout the entire world, for bridges, steel cars, tanks, signal apparatus etc. Made in FIRST QUALITY only. Write us for long service records and booklet No. 152-B.

Made in JERSEY CITY, N. J., by the

JOSEPH DIXON CRUCIBLE COMPANY

DXN TRADE MARK ESTABLISHED 1827 DXN TRADE MARK

THE NATIONAL

Quadruple Shear Yoke

FOR PASSENGER AND TENDER SERVICE

Illustrations and Details on Application

The National Malleable Castings Co.

Cleveland Chicago Indianapolis Toledo
Sharon, Pa. Melrose Park, Ill.

PEERLESS

MECHANICAL RUBBER GOODS AND PACKINGS HAVE THAT DURABILITY DEMANDED BY RAILROADS.

Peerless Rubber Mfg. Co.

31 WARREN ST. NEW YORK
BOSTON CHICAGO PHILADELPHIA MINNEAPOLIS

Specialization

Produces Highest Efficiency

* * * * *

Air Brake building is a business in itself—and one of the most important, because of the lives and property the Air Brake protects. It is a specialist's business, and to obtain best results, should be conducted by specialists.

* * * * *

Westinghouse Air Brake Co.

General Offices and Works, Wilmerding, Pa.

Westinghouse
Electric Arc Welding Outfits

have reduced the repair costs in many railroad shops.
They save their cost in three months time.
Full information on request.—Booklet 3049-A.

Westinghouse
Electric Motors for Railroad Shops

Pressed-Steel Types for either alternating or direct current. Rugged, serviceable, efficient and long lived.
Full information on request.

Westinghouse Electric & Manufacturing Co.

Sales Offices In All
Large American Cities

EAST PITTSBURGH
PENNSYLVANIA

2-10-2 TYPE LOCOMOTIVES

Total Weight of Engine, 352,500 pounds; Weight on Drivers, 293,000 pounds; Diameter of Drivers, 57 inches; Tube Length, 17 feet; Boiler Pressure, 190 pounds; Cylinders, 28x32 inches; Maximum Tractive Power, 71,200 pounds.

Because of its long rigid wheel base many railroad officials have had to eliminate the 2-10-2 type when considering more powerful locomotives.

Lateral motion driving axles and boxes were applied to the New York, Ontario & Western, 2-10-2 type locomotives to reduce the rigid wheel base to that which is in common use on Consolidation and Mikado type locomotives, and at the same time secure the advantages of the ten-coupled wheel arrangement with the resulting increased capacity of the locomotives.

Write us for further information regarding the lateral motion device

AMERICAN LOCOMOTIVE COMPANY
30 CHURCH STREET, NEW YORK

YOU GET THE MAXIMUM OF DURABILITY FROM OUR

SEMAPHORE ENAMEL

All colors—Write to us for samples.

Yarnall Paint Company
MANUFACTURERS - - - PHILADELPHIA

READING SPECIALTIES COMPANY
GENERAL OFFICE AND WORKS, READING, PA.

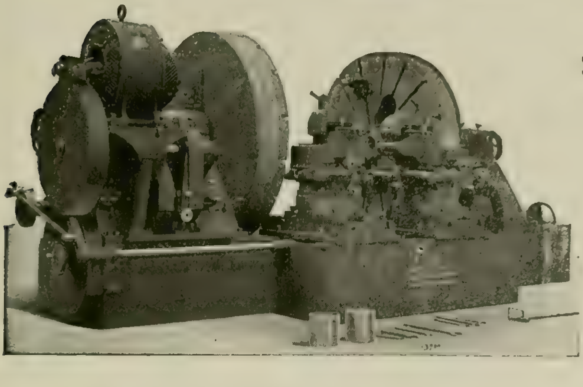
BRANCH OFFICES

New York, 111 Broadway
Chicago, Railway Exchange Bldg.
Atlanta, Fourth Nat'l. Bank Bldg.
Washington, Colorado Building.
Pittsburgh, Oliver Building.
Denver, First National Bank Bldg.
Los Angeles, W. H. Helman Bldg.

"Reading" Guard Rail Clamps
"Reading" Rail Benders
"Reading" Rerailers & Clamps
"Reading" Compromise Joints

Railroad Repair Shop Equipment

Combining all modern features for
rapid, convenient operation.



MACHINE TOOLS

STEAM HAMMERS

ELECTRIC
TRAVELING
CRANES

P. & W.
SMALL TOOLS
AND M. C. B.
GAUGES

Niles New Model Driving Wheel Lathe
Has broken all wheel shop records.

WRITE FOR CATALOGU

NILES-BEMENT-POND CO

111 Broadway, New York. Pittsburgh Office, Frick Building.

---

500 RAILROAD SHOPS

Have Adopted Thermit Welding as a Standard for Frame Repairs

The list of railroads using Thermit includes practically every system from the small road having only a few locomotives to the largest system having many thousand locomotives.

The superheated liquid Thermit steel is produced in bulk and poured all at once into a mold surrounding a broken section, resulting in the perfect amalgamation of the Thermit steel with the parts with which it comes in contact. The fact that those parts are first preheated, makes the weld doubly sure.

Remember that the greatest railway systems in the world use hundreds of thousands of pounds of Thermit. They do not use it for any reason except that it "delivers the goods," and has proved itself the most profitable investment.

Full information is given in our instructive pamphlet No. 2167, "Thermit Locomotive Repairs," and shows how effectively and economically the process can be used. Send for a copy today.

GOLDSCHMIDT THERMIT COMPANY

120 BROADWAY, NEW YORK

329-333 Folsom St., San Francisco; 103 Richmond St., W.,
Toronto, Ont.; 7300 So. Chicago Ave., Chicago

THE BALDWIN LOCOMOTIVE WORKS

PHILADELPHIA, PA., U. S. A.

LOCOMOTIVES

OF EVERY DESCRIPTION

Electric Motor and Trailer Trucks

SECURITY

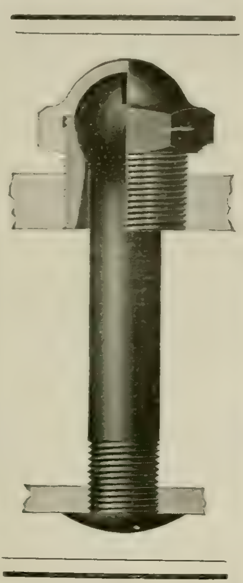
SECTIONAL ARCH

Makes staybolt inspection easy.
Saves flue troubles.
Reduces engine failures.
Easy to apply and remove.
Small brick of light weight.
Cools off quickly.
Many other good features.

AMERICAN ARCH COMPANY

30 Church Street,
New York

McCormick Building,
Chicago



The Best Staybolt
FOR LOCOMOTIVE FIREBOXES

Railroads Are Now Using
The Tate Flexible Staybolt
At the Rate of
1,250,000 A YEAR

Our Services Are Always
At Your Command

FLANNERY BOLT CO.
Vanadium Building
PITTSBURGH, PENNA.
B. E. D. Stafford, General Manager

J. Rogers Flannery & Co.
SELLING AGENTS
Vanadium Building
PITTSBURGH, PENNA.

The Draper Manufacturing Co.
Manufacturers of
PNEUMATIC FLUE WELDERS

For Scarfing, Welding and Swedging Boiler Flues up to 4" Diameter.

Pneumatic Tube Welding Machines for Welding and Swedging Superheater Tubes.

Flue Reclaiming Equipment used in connection with Pneumatic Flue Welders.

HUNT-SPILLER IRON
HAS THE
STRENGTH AND WEARING QUALITIES
THAT ARE ABSOLUTELY NECESSARY IN
LOCOMOTIVE CASTINGS
PRICES MODERATE RESULTS GREAT
Manufactured Only By
Hunt-Spiller Manfg. Corporation
W. B. LEACH, President and Gen'l Manager.
J. G. PLATT,
Sales Manager
OFFICE AND WORKS:
383 DORCHESTER AVENUE
SO. BOSTON, MASS.

GALENA-SIGNAL OIL COMPANY

FRANKLIN, PENNA.

Sole manufacturers of celebrated

GALENA LUBRICANTS

PERFECTION VALVE and SIGNAL OILS

and

Galena Railway Safety Oil

Manufactured for

STEAM AND ELECTRIC RAILWAY USES EXCLUSIVELY

Guaranteed Cost **Expert Service Free**

CHARLES MILLER,
Chairman.

S. A. MEGEATH,
President.

FORT PITT MALLEABLE IRON CO.

PITTSBURGH, PENNA.

MANUFACTURING SPECIALISTS
OF MALLEABLE CASTINGS
FOR THE RAILROAD AND
CAR COMPANY TRADE.

FEATURES

Superior Quality

Expeditious Delivery

Consistent Price

INDEX—ADVERTISERS.

NAME	Page
American Arch Co.	x
American Brake Shoe & Foundry Co.	iii
American Locomotive Company	viii
Baldwin Locomotive Works	x
Ball Chemical Co.	v
Brady Brass Co.	Front Cover
Butler Drawbar Attachment Co.	xviii
Chicago Pneumatic Tool Co.	v
Davis Brake Beam Co.	xxi
Dixon, Jos., Crucible Co.	vi
Flannery Bolt Co.	xi
Fort Pitt Malleable Iron Co.	xii
Galena Signal Oil Co.	xii
General Electric Co.	xvii
Gem Manufacturing Co.	Front Cover
Goldschmidt Thermit Co.	ix
Gould Coupler Co.	ii
Graham Nut Company	Front Cover
Homestead Valve Mfg. Co.	iv
Hunt-Spiller Mfg. Co.	xi
Independent Pneumatic Tool Co.	ii
Jacobs-Shupert U. S. Fire Box Co.	xvi
Johns-Manville Co.	xix
Johnson Bronze Co.	i
Locomotive Stoker Co.	xv
Magnus Company	vi
Mahr Manufacturing Co.	iii
Manning, Maxwell & Moore	iii
McConway & Torley Company	xv
Nathan Manufacturing Co.	iv
National Car Wheel Co.	iii
National Malleable Castings Co.	vi
Niles-Bement Pond Co.	ix
Page Woven Wire Fence Co.	Front Cover
Peerless Rubber Mfg. Co.	vi
Pressed Steel Car Co.	xx
Reading Specialties Co.	viii
Railway Steel Spring Co.	xvi
Safety Car Heating & Lighting Co.	xvi
Schaefer Equipment Co.	xviii
Sipe, James B., & Co.	iv
Standard Coupler Co.	xix
Standard Steel Car Co.	xviii
Steel Car Forge Co.	Front Cover
Stucki Co., A.	xxi
Suydam, M. B. Co.	Back Cover
The Superheater Co.	Front Cover
The T. H. Symington Co.	v
The Draper Manf'g Co.	xi
The O. & C. Co.	xxii
The U. S. Metallic Packing Co.	xvi
Union Spring & Mfg. Co.	xiv
Union Steel Casting Co.	xix
Vapor Car Heating Co., Inc.	xix
Westinghouse Air Brake Co.	vii
Westinghouse Electric & Mfg. Co.	vii
Yarnall Paint Co.	viii

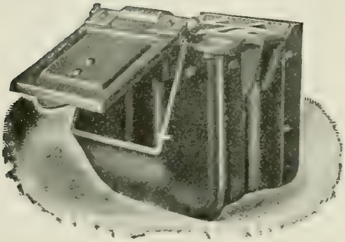
Union Spring & Manufacturing Co.

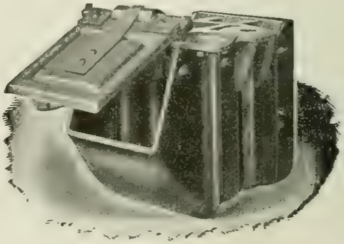
SPRINGS

Kensington All Steel Journal Boxes

PRESSED STEEL JOURNAL BOX LIDS

STEEL CASTINGS





Lightest and Strongest M. C. B. Journal Boxes Made.

WORKS:
NEW KENSINGTON, PA.

GENERAL OFFICE:
First National Bank Bldg., Pittsburgh, Pa.

NEW YORK - 50 Church Street.
CHICAGO - Fisher Building.
ST. LOUIS - Missouri Trust Building.
RICHMOND, VA., AMERICAN NATIONAL BANK BUILDING.
LOUISVILLE, KY., 42 Todd Building.

OFFICIAL PROCEEDINGS
OF
The Railway Club of Pittsburgh

Organized October 18, 1901.

Published monthly, except June, July and August, by The Railway Club of Pittsburgh, J. B. Anderson, Secretary. General Offices, Penna. R. R., Pittsburgh, Pa.

Entered as Second Class Matter February 6, 1915, at the Postoffice at Pittsburgh, under the Act of March 3, 1879.

Vol. XVI.
No. 7.

Pittsburgh, Pa., May 25, 1917.

$1.00 Per Year
[illegible] Per Copy

OFFICERS FOR 1916—1917

President
J. G. CODE,
General Manager, Pgh. & W. Va. Ry.,
Pittsburgh, Pa.

First Vice President
H. H. MAXFIELD,
Supt. Motive Power, P. R. R.,
Pittsburgh, Pa.

Second Vice President
D. M. HOWE,
Paint Expert,
Pittsburgh, Pa.

Secretary
J. B. ANDERSON,
Chief Clerk, Supt. M. P., P. R. R.,
Pittsburgh, Pa.

Treasurer
F. H. STARK,
Genl. Supt., Montour R. R.,
Coraopolis, Pa.

Executive Committee

L. H. TURNER, Supt. Motive Power, P. & L. E. R. R., Pittsburgh, Pa.
D. J. REDDING, Asst. Supt. Motive Power, P. & L. E. R. R., McKees Rocks, Pa.
F. R. McFEATTERS, Supt. Union R. R., East Pittsburgh, Pa.
A. G. MITCHELL, Supt. Monon. Div., Penna. R. R., S. S., Pittsburgh, Pa.
F. M. McNULTY, Supt. Motive Power, Monon. Conn. R. R., Pittsburgh, Pa.

Finance Committee

STEPHEN C. MASON, Secretary, The McConway & Torley Co., Pittsburgh, Pa.
E. K. CONNEELY, Asst. to Vice President, P. & L. E. R. R., Pittsburgh, Pa.
CHAS. A. LINDSTROM, Asst. to President, Pressed Steel Car Co., Pittsburgh, Pa.
L. C. BIHLER, Traffic Manager, Carnegie Steel Co., Pittsburgh, Pa.
WALTER V. TURNER, Asst. Manager,
Westinghouse Air Brake Co., Wilmerding, Pa.

Membership Committee

FRANK J. LANAHAN, President, Fort Pitt Malleable Iron Co., Pittsburgh, Pa.
A. STUCKI, Engineer, Pittsburgh, Pa.
C. O. DAMBACH, Supt., Pgh. & W. Va. Ry., Pittsburgh, Pa.
HARRY HOWE, Inspector of Castings, Pressed Steel Car Co., McKees Rocks, Pa.
R. L. KLEINE, Chief Car Inspector, P. R. R., Altoona, Pa.
B. E. D. STAFFORD, General Manager, Flannery Bolt Company, Pittsburgh, Pa.
SAMUEL LYNN, Master Car Builder, P. & L. E. R. R., McKees Rocks, Pa.

Entertainment Committee

D. H. AMSBARY, District Manager, Dearborn Chemical Co., Pittsburgh, Pa.
HARRY MURDOCH, President, H. Murdoch & Co., Pittsburgh, Pa.
E. C. SATTLEY, General Manager, Page Woven Wire Fence Co., Monessen, Pa.

Past President

J. H. McCONNELL..........October, 1901, to October, 1903.
L. H. TURNER..........November, 1903, to October, 1905.
F. H. STARK..........November, 1905, to October, 1907.
* H. W. WATTS..........November, 1907, to April, 1908.
D. J. REDDING..........November, 1908, to October, 1910.
F. R. McFEATTERS..........November, 1910, to October, 1912.
A. G. MITCHELL..........November, 1912, to October, 1914.
F. M. McNULTY..........November, 1914, to October, 1916.

* Deceased.

Meetings held fourth Friday of each month, except June, July and August.

PROCEEDINGS OF MEETING, MAY 25, 1917.

The regular monthly meeting was called to order in the auditorium of the Commercial Club, Pittsburgh, Pa., at 8 o'clock, P. M., with President J. G. Code in the chair.

The following gentlemen registered:

MEMBERS.

Amsbary, D. H.
Anderson, A. E.
Anderson, J. B.
Arnold, J. G.
Babcock, F. H.
Barth, J. W.
Batty, John
Berghane, A. L.
Brock, J.
Burket, C. W.
Chester, C. J.
Clark, C. C.
Cline, W. A.
Cocayne, W. H.
Code, J. G.
Cornelius, R. D.
Courtney, D. C.
Cunningham, R. I.
Cunningham, W. P.
Daly, P. J.
Dambach, C. O.
DeVore, H. T.
Duffy, J. F.
Emery, E.
Farquhar, L. C.
Ferren, R. O.
Fields, D. T.
Fulton, A. M.
Gale, C. H.
Grewe, H. F.
Grieve, R. E.
Gross, C. H.
Haynes, J. E.
Heckmon, C. J.
Howe, D. M.
Huchel, H. G.
Katzin, Wm.
Kindle, W. L.
Lansberry, W. B.
Lobez, P. L.
Long, R. M.
Lowe, W. D.
Lynn, Wm.
Marrion, S. R.
Maylock, E. A.
Meyer, W. J.
Mott, S. L.
McClumpha, H. E.
McCollum, G. C.
McDonnell, F. V.
McKinstry, C. H.
McNulty, F. M.
Neel, T. M.
Parry, Wm. I.
Parke, F. H.
Pennington, F. W.
Price, G. L.
Proven, J.
Rabold, W. E.
Rea, C. S.
Schaaf, A. J.
Schaich, W. L.
Scott, R. T.
Seiss, Wm. C.
Shorthill, R. R.
Sleeman, W. C.
Spielmann, J. A.
Staneart, R. A.
Stark, F. H.
Stillings, Wm.
Stucki, A.
Taylor, James
Thomas, J. H.
Thurlby, A. R.

VonKrogh, F. F.
Warne, J. C.
Wegener, H.
Williamson, J. A.
Wyke, J. W.
Zafra, Carlos de

VISITORS

Ague, Fred
Brown, A. W.
Burk, Wm. T.
Conroy, L. W.
Davis, Chas. L.
Davis, D. C.
Garratt, L. W.
Gove, Wm. G.
Hagan, W. T.
Hanna, Wm.
Horn, G. L.
Johnson, R. C.
Kerr, W. M.
Levier, F. L.
Lyndon, George W.
Marvin, C. H.
Reynolds, J. D.
Robertson, J. F.
Shock, G. S.
Steigerwalt, R. W.
Trist, N. B.
Ward, W. H.
Welker, Frank
Wright, A. H.
Vial, F. K.

The roll call was dispensed with, the record of attendance being had from the registration cards.

The reading of the minutes was dispensed with by consent, and they were approved as published.

The Secretary read the following list of applicants for membership:

Burgoon, J. A., Chief Passenger Clerk, B. & O. R. R., 4414 Fifth Avenue, Pittsburgh, Pa. Recommended by J. A. Spielmann.

Field, Frank R., District Manager, Bird-Archer Co., 1503 First National Bank Building, Pittsburgh, Pa. Recommended by J. E. Haynes.

McLain, J. E., Sales Manager, Midvale-Cambria-Worth, 1821 Oliver Building, Pittsburgh, Pa. Recommended by Frank J. Lanahan.

PRESIDENT: As soon as these applications have been approved by the Executive Committee the gentlemen will become members, upon the payment of one year's dues, without further action.

The Secretary announced the death of G. E. Trautwein who became a member of the Club February 25, 1916 and died March 27, 1917.

PRESIDENT: An appropriate memorial minute will appear in the next issue of the Proceedings.

PRESIDENT: If there is no further business, we are to hear a paper on "A Survey of the Mechanics of the Chilled Iron Car Wheel" to be presented by Mr. George W. Lyndon, President of the Association of Manufacturers of Chilled Car Wheels, assisted by Mr. F. K. Vial, Consulting Engineer. It is my understanding that Mr. Lyndon is to speak first and I therefore take pleasure in introducing to you Mr. George W. Lyndon.

A GENERAL SURVEY OF THE MECHANICS OF THE CHILLED IRON CAR WHEEL.

By George W. Lyndon.
F. K. Vial.

Mr. President and Gentlemen: To receive an invitation to appear before The Railway Club of Pittsburgh, located as it is in this busy and thriving mart of the steel industry, is indeed an honor. We assure you that the opportunity is appreciated, and it will be our endeavor to tell you something about the Chilled Iron Wheel.

"Tell me," said a business man, "why is it that steel has supplanted iron in the rail, wood in the car, and multitudinous parts of the car and track structure, and has never succeeded in making appreciable inroads on the Chilled Iron Wheel." The reply was that the material known as Chilled Iron has been found by continuous use for sixty-seven years to be the best adapted for the service, and its superiority is not entirely because of scientific processes which have been used in making the wheel, but principally because of the material.

Chilled Iron has remained in the forefront ever since its introduction in 1850, and is today an important factor in the nation's commerce, and this is because it possesses inherent qualities which are not found in other metals, and its principal characteristics are its ability to carry any load that can be supported by the steel rail without crushing or flowing, and these features of Chilled Iron will be proved by scientific data in another part of this paper.

We must confess that we have not, until quite recently, made a sufficient study of the fundamentals of Chilled Iron, and the manufacturers are perhaps to blame for not having ascertained the tremendous increased duty required due to increased loads, with particular reference to heat stresses developed in service from brake application. Nevertheless since the year of 1909, when the manufacturers assembled and organized an Association known as the Association of Manufacturers of Chilled Car Wheels, we have made a close study of the wheel and its exacting conditions of service, and the result has been that we have been enabled to make recommendations to the associations with which we have had to deal, for improved standards.

Our greatest accomplishment was in the year of 1909, when we succeeded in establishing three standard patterns for the thirty, forty and fifty-ton cars, and substituted these three patterns for the hundreds of special patterns which were used not only by the manufacturers, but by the railways themselves who manufactured their own wheels.

Uniformity of design was therefore established in the year of 1909, and this was the first concerted recommendation of the manufacturers as a whole, and placed these designs in line for further improvement.

We were, therefore, certain that all of the manufacturers represented in our association were making wheels from the same general pattern, which was a step in the right direction.

That the general design was good has been proved by continuous service; nevertheless we have been able to discover some improvements in design, which we have undertaken to have approved by the Master Car Builders' Association, but thus far we have not been able to secure our suggested improvements.

We may say frankly that the work which has been done for the past eight years by our association, in conjunction with committees and other associations with which we have had to deal, has not yielded us material results; nevertheless we have gone along in our work with committees, with associations, with government bureaus, with state universities and with railway clubs, all for educational purposes, firmly believing that we were on the right track and that sooner or later our recommendations would be endorsed.

There is no question from our viewpoint but what we are entitled to an increased flange, yet the Master Car Builders say that an increased flange is unnecessary.

We believe that it is just as necessary to increase the flange section as it is necessary to increase all other sections of the wheel when increased duty is imposed, and notwithstanding the fact that the Master Car Builders, in their last report, stated that no increased flange width was necessary, we have just been advised that this matter is by no means settled, as far as other associations are concerned, and that a movement is again in process of investigation to determine whether the hundreds of thousands of flanges that are now in use which are wider than the present M. C. B. standard flange, are not entirely in harmony with the present track standards.

When this question is answered, and, gentlemen, the question of track clearance ought to have been answered long ago, we will then have an opportunity to present to the Master Car Builders' Association a flange with an increased factor of safety, which we believe we are entitled to.

The mechanics of the chilled iron wheel have never been investigated except in a very superficial way. The fundamental properties of chilled iron, such as specific gravity, modulus of elasticity for varying tensile strengths, action under repeated stresses, relation of operating conditions to temperature stresses, etc., are not established. Dollars are spent in the investigation of steel where cents are devoted to chilled iron. In the face of this neglect the chilled iron wheel by sheer merit survives the struggle for existence. A belated pause to consider the basis for this vitality will not be wasted. If the properties of chilled iron were fully understood and properly used in the wheel, a large return on the meager expenditure for investigation would flow in upon the manufacturers in the way of increased profits and to the railroads in the way of reduced costs.

Its economic importance can be realized when it is borne in mind that there are 25,000,000 such wheels in service, representing 8,000,000 tons of metal, requiring an annual production of 3,000,000 wheels, or approximately 1,000,000 tons of chilled iron to replace those worn out in service.

Its supremacy for railway transportation has been secured because it possesses properties that are more nearly ideal for that service than is enjoyed by any other type of wheel.

Among the advantages which have contributed to its enviable reputation are the following:

First:—Hardness of tread, which gives a maximum service for the least loss of metal.

Second:—The coefficient of friction between wheel and brake shoe is 25% greater than developed by steel under the same pressures. This is of great advantage in reducing the strain on the brake rigging and trucks, giving greater capacity to air cylinders and air pumps on the engines, etc.

Third:—The durability of brake shoes when used on chilled iron is 25% to 100% greater than when used on steel, the variation depending upon the type of shoe used. The slow-wearing insert shoes commonly used on chilled iron wheels cannot be used on the steel wheel on account of their scoring action.

Fourth:—The abrasion between a chilled iron flange and a steel rail is much less than that of a steel flange against steel rail. The chilled iron flange, therefore, reduces the loss in metal from the flange and also from the rail, which is an item of great economic importance.

Fifth:—That part of train resistance which is developed thru flange friction and tread slippage is materially less in the case of chilled iron wheels than with steel wheels. This is one of the most important items of economy in connection with the chilled iron wheel.

Sixth:—A chilled iron tread, on account of the absence of ductility, retains its rotundity to a greater extent than is possible in treads made of steel. Large numbers of broken rails have, by thorough investigation, been found to have been caused by eccentric wheels. The ordinary flat spots of 2½ inches occurring in the chilled iron wheel do not produce anything like the impact blow that is developed in the case of an eccentric wheel. In case the flat spot is iron out, an elongated flat spot or an eccentric wheel is produced. This does not occur in the chilled iron wheels and, therefore, a noise is developed such that the location of the defect is always discovered, which is not the case with the eccentric wheel.

SEVENTH:—The scrap value of a chilled iron wheel is relatively greater than that of any other material, largely on account of the scattered locations of wheel foundries throughout the country. This is especially true in the West.

EIGHTH:—Chilled iron will carry heavier loads without distortion or cold rolling the surface metal than is possible with other metals.

NINTH:—No expensive lathes are required for machining treads, thereby saving a large investment in shop and machinery.

It is not the purpose of this paper to dwell upon the economic phase of the subject, for this is fully established, but rather to offer a few suggestions that will ultimately lead to a more intelligent design and classification of wheels for the service they are to perform. Since 1875 wheel loads have increased 500%, axle weights 205% and wheel weights 75%. The phenomenal growth in wheel loads is shown in Figure 1.

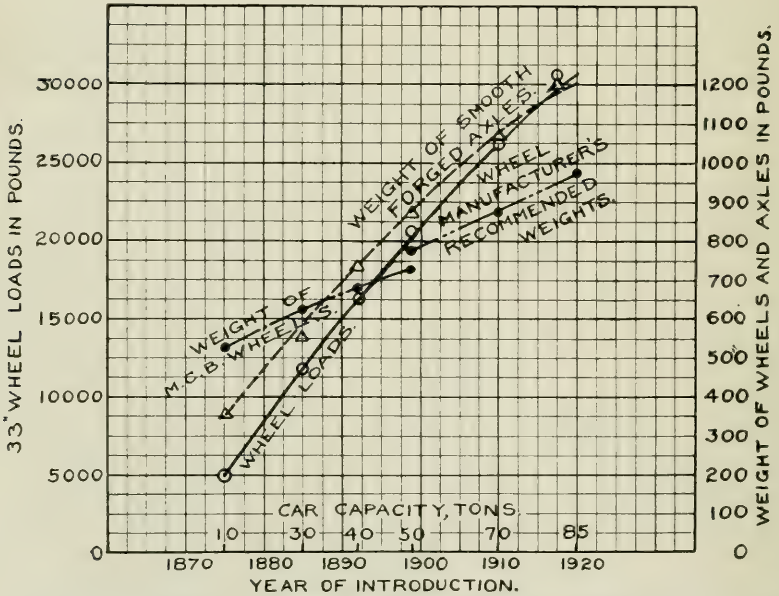


Fig. 1.—Increases in Loads Carried on Each Wheel; also in the Weights of Standard Axles and Wheels Since 1875.

Figure 2 shows the 6½x12 axle and wheel used on the Pennsylvania and Union Pacific Railroads.

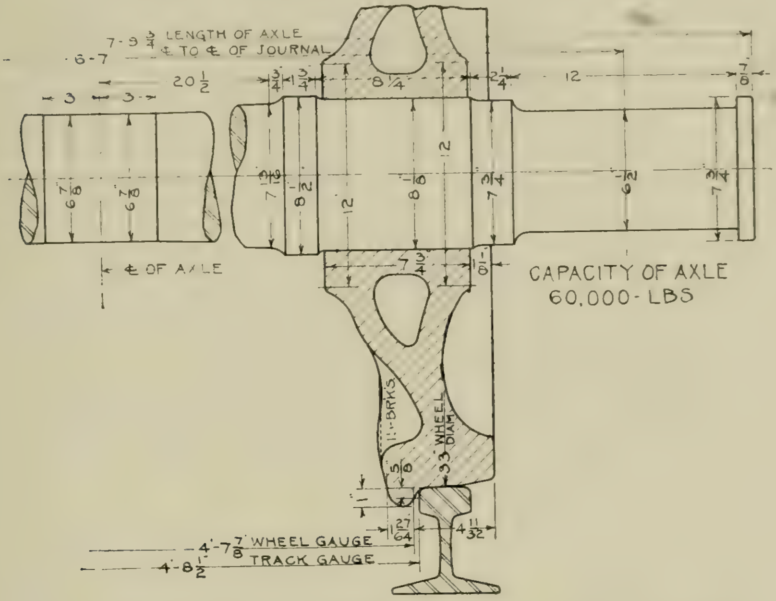


Fig. 2.—Section of a 33 In. Wheel Mounted on a 6½x12 In. Axle—The Largest Axle Applied to Cars or Locomotive Tenders.

Notwithstanding this rapid development, statistical information shows that the number of wheel failures during the past 10 years are far less in percentage than during the decade prior to the introduction of the 100,000-pounds capacity car. This favorable record has delayed a study of the relations of stresses originating in service and the factor of safety in different parts of the wheel. An analysis of wheel failures strongly indicates that the majority occur because of an entire disregard of rules of standardization and extremely unfair usage.

A few years ago it was not uncommon to find articles in railway journals intimating that it was doubtful whether the wheel load under a fifty-ton car had not passed the limit that could safely be carried by a chilled iron wheel. Recently, however, the absence of such articles are particularly noticeable.

During the years 1914 and 1915 the M. C. B. Wheel Committee made a special effort to collect from all railroads and tabulate all failures of chilled iron wheels with particular reference to flange failures and cracked plates. Contrary to expectations, extremely few broken flanges were reported and the item of cracked plates were 30 per cent more prevalent in the 60,000-pounds capacity cars than in the 100,000-pounds capacity cars, and more than half of the cracked plate wheels in the 30-ton cars were confined to cars above 42,000 pounds light weight, which constitutes less than five per cent. of the total equipment in that class. This indicates that the load carried is not a true criterion of stresses developed within the wheel.

It is certain that wheel failures would be practically eliminated if the magnitude and intensity of the internal stresses, which are developed by various operating conditions, were fully established and the wheel designed and used accordingly. No investigation along these lines has ever been attempted by committees that fix wheel standards, and the rules established by manufacturers are not officially recognized. If we review the M. C. B. proceedings we find hundreds of pages of valuable information regarding the properties of brake shoes and other parts of the car but nothing whatever to indicate a constructive effort to establish the fundamental properties of chilled iron or the origin and magnitude of the stresses within the wheel.

Inasmuch as loads 50 per cent in excess of those required under 100,000 pounds capacity cars are now safely carried by chilled iron wheels, it is well to consider whether wheel loads of 30,000 pounds are nearing the limit of capacity of chilled iron and if so, in just what way it will become manifest in different parts of the wheel.

The particular items requiring investigation to establish this information are:

- Bearing Power of Chilled Iron.
- The Effect of Cone on Wheel and Rail Service.
- Stresses Developed
  - Within the Flange.
  - In the Plate from Flange Pressure.
  - By Vertical Load.
  - From Axle Pressure.
  - In the Plate by Heat from Brake Friction.

Coefficient of Friction and Rate of Metal Loss in Shoes Continuously Applied at Varying Pressures and Velocities.

Destruction of Metal in the Tread by Excessive Local Heating Caused by Irregularities in Equipment.

Irregularities in Stresses Produced by Differences in Equipment having the same Wheel Load.

Bearing Power of Chilled Iron.

The bearing power of iron or steel depends largely upon its hardness and hardness is controlled by the carbon content. Pure iron containing no carbon is soft and ductile, and therefore has very low bearing power. As the carbon content increases the metal becomes less ductile, and its ability to carry heavy loads without distortion increases. Rail steel contains about .70 percent of carbon. The tread of the chilled iron wheel contains about 3.50 carbon and is, therefore, practically devoid of ductility and is capable of carrying the heaviest concentrated loads found in railroad or crane service without any indication of surface distortion. The strain in the surface metal is, therefore, very much less than in rail steel, for example, where the movement of the metal commonly called flowing or cold rolling produces excessive surface strains sufficient to cause rupture of the entire section.

This is a condition which is constantly brought to our attention in the form of tranverse fissures which are the result of excessive tensile stresses in the head of the rail originating from repetitions of pressures which cause a distortion in the surface metal and in time a strain is produced greater than the resisting power of the metal. (See Figure 3). This distortion coupled with the alternating stresses due to beam action develop a progressive fracture, the phenomena of which have been so well analyzed by Mr. James E. Howard, Engineer Physicist of the Division of Safety of the Interstate Commerce Commission.

Whenever a load is placed upon a rail, a certain depression is made which extends a considerable distance in the form of a wave in each direction from the surfaces which are actually in contact. This action is shown in Figure 3 which indicates that the total depression is made up of two parts. First, the part below the contact area, which represents the actual indentation or penetration of the wheel into the surface of the rail. The remainder of the measured depression consists of several items.

1. Yielding of the metal beyond the surfaces actually in contact.
2. Compression of the rail through which the load was delivered.
3. Possible compression of the cross head of the testing machine.
4. The measurements were taken in such a way that the compression in the wheel is included.

For the same load, however, items 2, 3 and 4 will be constant and the difference represents the effect of varying diameters of the wheel.

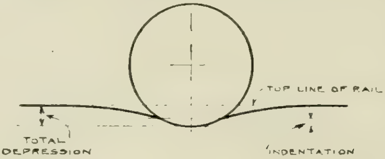


Fig. 3.—Illustrates Depression in Surface of Rail Under Wheel Load.

The area of surfaces in contact is nearly proportional to the applied wheel load and is not materially affected by wheel diameter. The identation into the rail is directly proportional to the load and inversely as the square root of the diameter of the wheel. The measurements taken for total depressions in the top of a rail having an 8-inch top radius are shown in Figure 4.

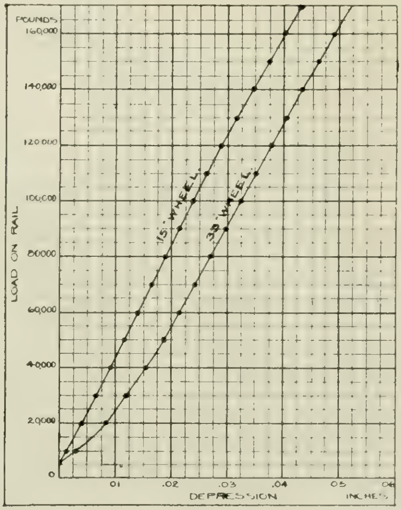
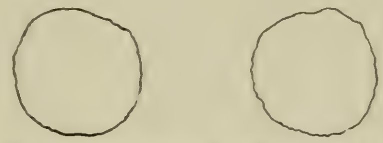
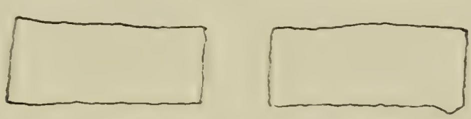


Fig. 4.—Curves Showing Total Depression in 85-lb. 8 In. Top Radius Rail Under Various Loads on 15 In. and 33 In. Chilled Iron Wheels.

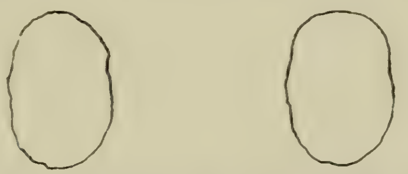
The areas of contact were measured on paper impression with a planimeter. The shape of the area in contact depends upon the shape of the head of rail. If the top of the head is curved the metal is flattened in the form of an ellipse, but if the head of the rail is flat, the area is in the shape of a rectangle as shown in Figure 5.



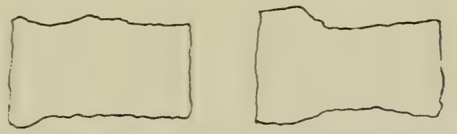
15 In. Chilled Iron Wheel with flat tread, 200,000 lb. load on 8 in. Top Radius rail. Area of indentation in rail 1.30 sq. in.



15 in. Chilled Iron Wheel with flat tread, 200,000 lb. load on rail with top planed flat. Area of indentation in rail 1.60 sq. in.



33 in. Chilled Iron Wheel with flat tread, 200,000 lb. load on 8 in. Top Radius rail. Area of indentation in rail 1.35 sq. in.



33 in. Chilled Iron Wheel with flat tread, 200,000 lb. load on rail with top planed flat. Area of indentation in rail 1.93 sq. in.

Fig. 5.—Areas of Contact in Top Surface of 85-lb. Rail Under Various Chilled Iron Wheels Carrying 200,000-lb. Load.
(Scale About One-Half.)

Chilled Iron Wheels are only slightly flattened by the most extreme load, and if we assume the entire indentation is in the rail, the depth can be calculated when the size and shape of the contact area is known. In the usual case of a rail having a curved top, the contact between wheel and rail forms an ellipse and the depth of penetration is found as follows:

Let $p = 3.1416$

$d =$ depth of depression

$r =$ radius of rail head

$D =$ diameter of wheel

$a =$ area of depression

$$a = p \sqrt{2rd} \sqrt{dD}$$

$$a = p \sqrt{2rd^2D}$$

$$a = 4.44\, d \sqrt{rd}$$

In the experiments the radius of the rail head was 8 inches and the area was

$$a = 12.56\, d \sqrt{D}$$

$$\text{Then} \quad d = \frac{a}{12.56 \sqrt{D}}$$

For rails having an actual radius of 12 inches the area would be:

$$a = 15.385\, d \sqrt{D}$$

$$\text{Then} \quad d = \frac{a}{15.385 \sqrt{D}}$$

For rails having a flat top whose width is w, the area is:

$$a = 2w \sqrt{Dd}$$

$$\text{Then} \quad d = \left(\frac{a}{2w \sqrt{D}}\right)^2$$

The area of contact between wheel and rail under various loads, the depth of penetration and pressure per square inch over the contract area were determined in a series of tests made by the Griffin Wheel Company. Table 1 indicates the results obtained with a 33-inch chilled iron wheel on a rail having a top radius of 12 inches. The depth of penetration was calculated by the formula given above.

Table 1—Bearing of 33-In. Chilled Iron Wheel on a Rail Having a 12-In. Top Radius.

Load	Area of Contact	Penetration in Rail	Pressure per Sq. In. of Contact
5000	.072	.00081	69700
10000	.114	.00129	87800
20000	.203	.00229	98500
50000	.436	.00492	114800
100000	.777	.00865	128800
150000	1.089	.01229	137800
200000	1.383	.01560	144600
250000	1.667	.01888	150000

The effect of diameter of the wheel on the depth of penetration into the rail under various loads is shown in Tables 2 and 3.

Table 2—Bearing of Wheels on 85-lb. A. S. C. E. Rail With 8-In. Top Radius Under 200,000-lb. Load.

Wheel	Area Contact	Depth of Penetration	Permanent Set in Rail	Mean Pressure	Total Depression
15-in. straight tread chilled iron	1.30	.027	.009	153800	.0535
20-in. straight tread chilled iron	1.34	.0212	.0115	149200	.0547
33-in. straight tread chilled iron	1.35	.018	.009	148100	.0647
33-in. M. C. B. chilled iron	1.60	.024	.0107	125000	.0580
On 85-lb. Flat Top Rail 2-In. Wide—Under 200,000-lb. Load.					
15-in. straight tread chilled iron	1.60	.0107	.011	125000	.0555
20-in. straight tread chilled iron	1.68	.0089	.001	119000	.0550
33-in. straight tread chilled iron	1.93	.0071	.001	103600	.0620

Table 3—Bearing of Straight Tread Chilled Iron Wheels on Standard 85-lb. A. S. C. E. Rail Under 100,000-lb. Load.

Diameter of Wheel	Area of Contact	Depth of Penetration	Permanent Set in Rail	Pressure per Sq. In. on Area of Contact	Total Depression
12	0.737	0.0138	0.0068	135,800	.023
16	0.745	0.0121	0.0051	134,200	.024
20	0.753	0.0109	0.0039	132,800	.026
24	0.761	0.0101	0.0031	131,400	.027
30	0.769	0.0091	0.0021	130,000	.029
33	0.777	0.0088	0.0018	128,800	.030
36	0.785	0.0085	0.0015	127,400	.031

On Flat Top Rail 2-In. Wide—Under 100,000-lb. Load.

Diameter of Wheel	Area of Contact	Depth of Penetration	Permanent Set in Rail	Pressure Per Sq. In. on Area of Contact
12	0.950	0.0031	none	105,000
16	0.960	0.0027	none	104,000
20	0.970	0.0024	none	103,000
24	0.980	0.0022	none	102,000
30	0.990	0.0020	none	101,000
33	1.000	0.0019	none	100,000
36	1.010	0.0018	none	99,000

Chilled iron wheels are not appreciably flattened by any load below 250,000 pounds. As far as bearing power is concerned, chilled iron is ideal for wheel service, and in addition thereto, the metal takes on a high polish and produces a minimum amount of friction when rubbing against the rail, which is a quality of prime importance. The absence of ductility prevents distortion of the metal; therefore, the tread maintains its original shape as regards taper and the wheel as a whole retains its rotundity to a greater extent than is possible with any other material.

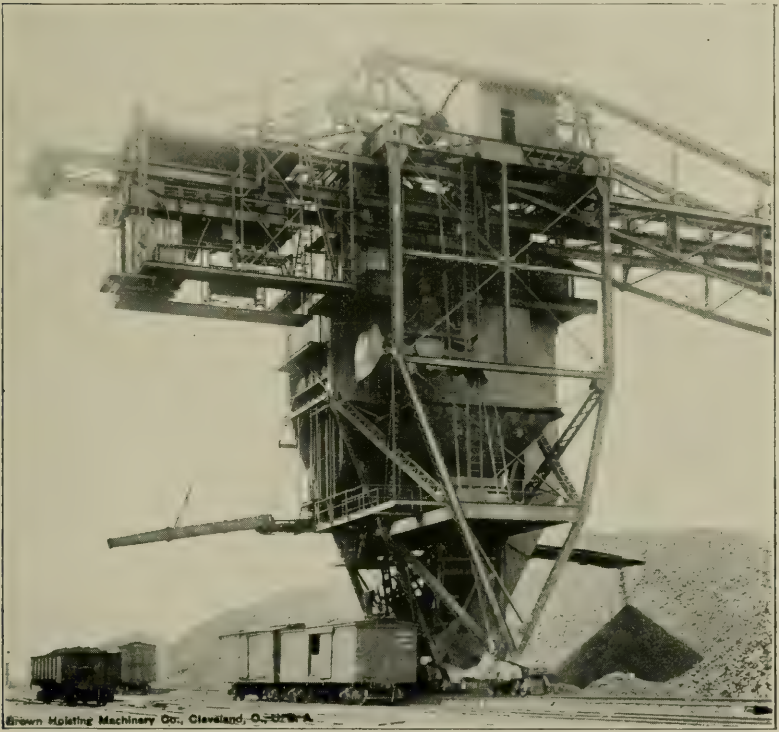
From all tests which have been made it is safe to assume that the average pressure per square inch over the contact area between wheel and rail is about 100,000 pounds. For extreme loads above 200,000 pounds on curved top rails, the pressure per square inch may reach 150,000 pounds. When the top of the rail is worn, the bearing area is increased, and the pressure per square inch correspondingly reduced.

Using 100,000 pounds as a factor for ordinary railway service, the formula for area of contact becomes $\frac{L}{100{,}000}$ which substituted in the previous formula gives the following relation between wheel load and indentation into rails having a 12-inch top radius — $L = 1{,}500{,}000\, d \sqrt{D}$

The first permanent set, which indicates passing the elastic limits of the rail, occurs when the indentation or penetration is approximately .007 inch. If we assume that in regular service, the wheel load will be such that the indentation shall not exceed one half this amount, we have the following results for maximum permissible wheel loads in railway service:

On wheels 42 in. in diameter—Load limit 34,000 lbs.
On wheels 36 in. in diameter—Load limit 31,500 lbs.
On wheels 33 in. in diameter—Load limit 30,200 lbs.
On wheels 30 in. in diameter—Load limit 28,800 lbs.

An indication of the bearing power of chilled iron is obtained from crane service where concentrated loads of over 100,000 pounds per wheel are not uncommon. One use for wheels of this type is to carry unloading bridges as illustrated in Figure 6. On account of the extreme width of span which may be more than 200 feet, the rails are not always parallel, especially when one rail is on the dock line. A spreading track brings strong pressure to bear on the flanges of the wheels, therefore the flanges are designed to climb the rail under full load and still have a factor of safety against breaking of 4 or 5.



Brown Hoisting Machinery Co., Cleveland, O., U.S.A.

Fig. 6—An Example of the Enormous Structures Carried on Chilled Iron Wheels.

In Figure 7 are shown a group of wheels designed for this class of service.

From the above analysis and in fact general experience indicates that 30,000 pounds load for a 33-inch wheel is about the

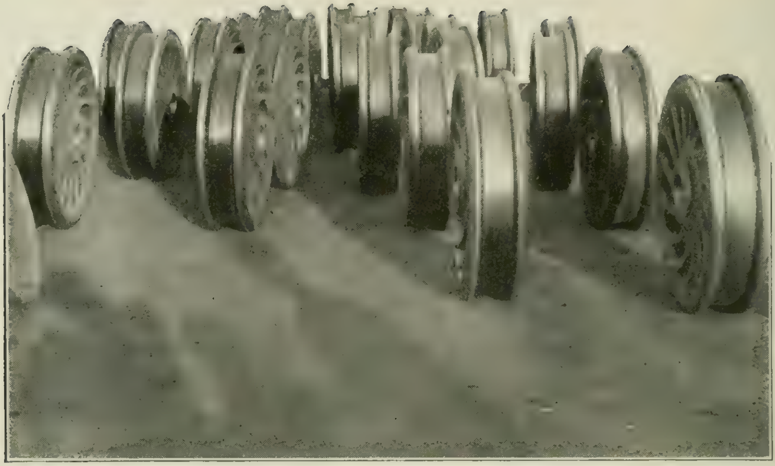


Fig. 7—Crane Wheels for Loads of 125,000 lbs. Each; Ultimate Resistance 400,000 lbs.

limit of rails of the present type. As far as wheels are concerned, double this load can be carried without the least sign of overload.

The limiting loads will always be governed by the bearing power of the rail rather than any consideration on the part of the wheel itself. For this reason chilled iron is ideal not only for railroad service but also for wheels under the heaviest concentrated loads such as occur under transfer tables, special cranes, unloading towers, swing bridges, etc., where the wheel load may exceed 100,000 pounds.

Effect of Coning.

It was early found that a certain amount of cone in the tread of a new wheel was advantageous from every standpoint. The present code of 1 in 20, shown in Figure 26, Page 251, which is the recommended standard of the M. C. B. Association, is also the standard in Europe where the practice is about equally divided between a uniform taper and a slight double taper. The world's standard may be said to be 1 in 20. The only variations in the United States are the 1 in 38, cone recently adopted by the New York Central Lines and the 1 in 13, which has long been standard on the Baltimore & Ohio R. R. These deviations have called for a complete discussion of the whole subject and various rail and wheel committees are now at work to determine the best standard. It is highly desirable that there should be but one standard taper, because the interchange of traffic largely nullifies any advantage that might accrue to any individual railroad by adopting a special taper of their own.

There are many erroneous ideas concerning the advantages of coning, such as adjusting the circumference of wheels to the difference in length of inner and outer rails on curves; affording an opportunity by lateral movement to find a common diameter when wheels are not of the same circumference at the taping line, and other claims of this character that do not seem to be based on careful investigation. A glance at the mechanics of the wheel rolling on the rail will show some of the advantages and disadvantages.

Position of Wheels on Curves.

The position taken by a rectangular flanged wheel base in passing a curve is shown in Figure 8.

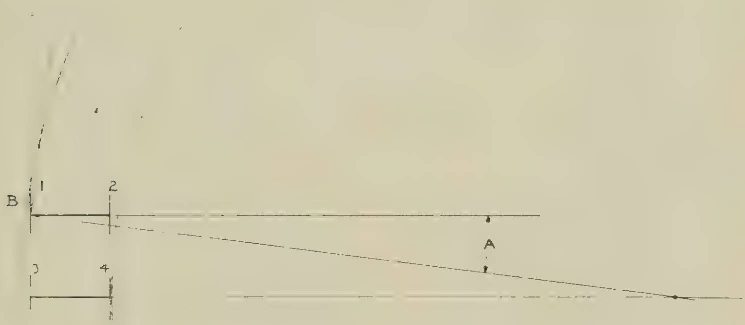


Fig. 8—Position Taken By Any Rectangular Flanged Wheel Base of Four Wheels While Passing Around a Curve.

The front outer wheel crowds hard against the rail. The rear axle assumes a radial position with the flange of neither wheel touching the rail unless the gauge is so tight that the inner rail is brought to the flange of the inner wheel, or if the wheel base is abnormally long, the same thing will be accomplished. The position shown is one of stable equilibrium and one to which the wheels will return if any force should momentarily disturb the position. To permanently change the position requires a force sufficiently strong to slide the wheels laterally.

The amount of coning has no effect on the position of the wheels or the amount of slippage except when the axles can act individually, in which case they can assume a radial position. In a four wheel truck it is evident that the coning cannot compensate for the difference in length of inner and outer rail because the axle of the first pair of wheels is not radial and the wheel engaging the outer rail is riding on the throat fillet entirely independent of the cone of the tread. The inner forward wheel does have a reduction in diameter because it is running away from the rail. This favorable condition, however, is practically destroyed because the axle of the trailer wheels is radial to the curve, and the inner wheel has a tendency to run toward the inner rail, thereby increasing its diameter as compared with the outer wheel which results in a composite action requiring slippage in all wheels. And even if the trailer wheels had a tendency to run towards the outer rail, the fact that there are four wheels in a rigid truck makes the resultant slippage very different from that which would occur if the axles could act independently. The advantage to be gained from coning the tread of wheel must come from some other source than the possibility of adjusting the diameter of wheels to suit various conditions of service.

Effect on Wearing Value of Wheel and Rail.

The loss of metal from the flange and tread of the wheel and also from the rail is caused by rubbing or sliding friction rather than by rolling friction. To secure a maximum wearing value the surfaces in contact must roll on each other and eliminate as far as possible all rubbing and slipping. A true rolling motion will be secured with no slippage when the wheel is traveling parallel to the rail. That the taper in the wheel has an effect on the relation of rolling to sliding friction is shown by the following analysis.

When a wheel rests upon the rail in the normal position, the location of the point of contact depends upon the top radius of the rail and taper of the wheel This is illustrated in Figure 9.

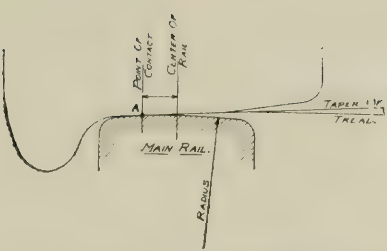


Fig. 9—Normal Contact Point Between Wheel and Rail. No Lateral Pressure on Flange.

The distance between the point of contact A and the center of rail is shown in Table 4. This distance represents the amount of eccentricity in loads applied to the rail.

Table 4—Distance from Center of Rail to Point of Contact Radius—Top of Rail.

	Taper	Angle	8″	10″	12″	14″	16″
	1 in 60	57′17.43″	.1333	.1667	.2000	.2333	.2667
	1 in 40	1 25′55.54″	.2000	.2500	.3000	.3500	.4000
1	1 in 38	1 30′26.77″	.2105	.2630	.3157	.3683	.4209
	1 in 30	1 54′32.95″	.2667	.3333	.4000	.4667	.5333
	1 in 25	2 17′26.20″	.3200	.4000	.4800	.5600	.6400
2	1 in 20	2 51′44.66″	.3999	.4999	.5999	.6998	.7998
	1 in 18	3 10′47.39″	.4437	.5547	.6657	.7767	.8877
	1 in 15	3 48′50.67″	.5321	.6651	.7981	.9311	1.0641
3	1 in 13	4 23′55.34″	.6136	.7670	.9204	1.0738	1.2272
	1 in 12	4 45′49.11″	.6644	.8305	.9966	1.1627	1.3288
	1 in 10	5 42′38.14″	.7960	.9950	1.1940	1.3930	1.5920

1—N. Y. C. Standard.
2—M. C. B. Standard.
3—B. & O. Standard.

If every part of the car were made perfect with no friction at the center and side bearings and if the roadbed was straight and in perfect condition, the wheels might travel for a considerable distance in the normal position with true rolling friction, provided that the wheels on the same axle had exactly the same circumference. If this condition could be secured the wearing value of wheel and rail would be greatly improved.

Unfortunately, perfect conditions are impossible and certain items cause the truck to travel at a slight angle to the track, requiring the flange of the wheel to press against the rail with sufficient intensity to guide the truck in the proper direction, and when in this position lateral resistance is developed which requires a second point of contact between the wheel and rail as shown in Figure 10.

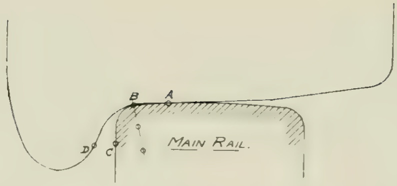
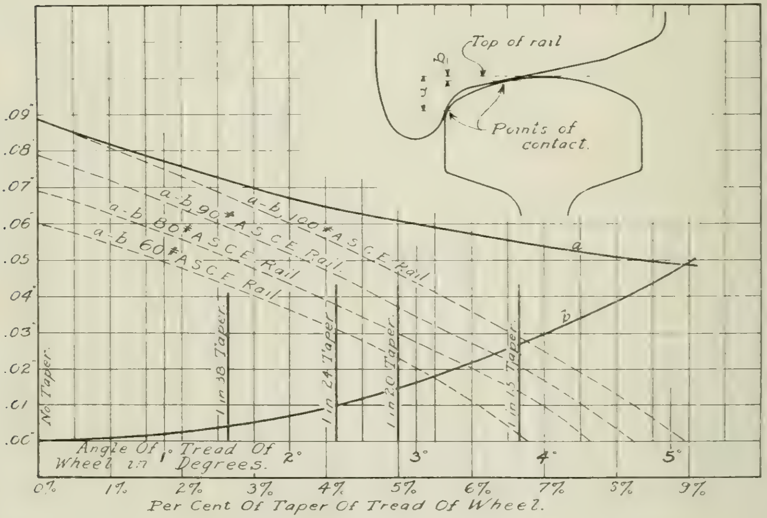


Fig. 10—Point "B" at Which Lateral Resistance Is First Encountered When Wheel Is Running Toward the Rail.

The wheel is now rolling on two points in the tread which are not equally distant from the center of rotation. Therefore, they cannot both have true rolling motion. The surfaces in contact at one point or the other must slide on each other to a certain extent which is the cause of rapid wearing of both rail and wheel.

The amount of slipping which is the chief factor in abrasion depends upon the distance between the two points of contact A and B and the difference in diameter of the wheel at these points. The effect of taper and rail section on these quantities is shown in Figure 11 for the A. S. C. E. Section and Figure 12 for A. R. A.—B. Section.



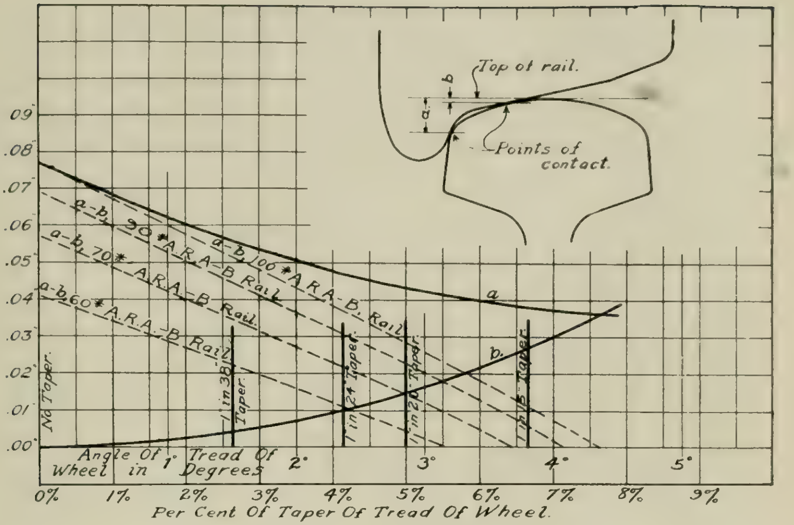


Fig. 11 and 12—Charts showing distance below top of A. R. A. and A. S. C E. rails of tread and flange contact points for wheels of all taper. Also difference between these quantities.

These graphical representations indicate the distance below the top of rail for each of the contact points, and the rapid decrease in the difference between these quantities as the taper increases.

In Table 5 are shown the horizontal distances between points of contact A and B and also the difference in the lengths of wheel diameters measured at those points.

We note from Table 5 and Figures 11 and 12 that the difference in diameter of the conical surfaces A and B of the wheel may vary from zero on a 1 in 13 taper tread wheel on 100 pound A. B. A. type A rail, to .178 on a cylindrical tread on a 100 pound A. S. C. E. rail. The amount of slippage on the rail for the maximum difference in diameter is 28.5 feet per mile of travel. This indicates that the taper on the wheel has a very decided influence on the loss of metal at the throat of the wheel which controls the production of sharp flanges and regulates the rate at which metal is worn from the top of the rail at the gauge side and constitutes a large element in rolling friction.

Table 5—Distances Between Contact and Gauging Points on Standard Rails and Wheels With Various Tread Tapers.

		A. S. C. E. Rail		A. R. A.—A Rail		A. R. A.—B Rail	
Taper	Weight of Rail	Distance A to B Inches	Difference in Dia. A & B Inches	Distance A to B Inches	Difference in Dia. A & B Inches	Distance A to B Inches	Difference in Dia. A & B Inches
No taper	100 lb.	1.216	.178	1.117	.146	1.217	.154
"	90 lb.	1.146	.158	1.012	.120	1.160	.152
"	80 lb.	1.075	.138	.977	.112	1.085	.122
"	70 lb.	1.039	.130	.909	.960	1.052	.116
"	60 lb.	1.003	.126	.842	.082	.887	.082
1 in 24	100 lb.	.660	.108	.452	.062	.570	.072
"	90 lb.	.589	.092	.348	.044	.512	.062
"	80 lb.	.517	.076	.305	.036	.435	.050
"	70 lb.	482	.068	.229	.024	.401	.044
"	60 lb.	.550	.092	.317	.044	.221	.020
1 in 20	100 lb.	.446	.062	.174	.018	.451	.068
"	90 lb.	478	.074	.210	.028	.393	.048
"	80 lb.	.407	.060	.176	.022	.317	.036
"	70 lb.	.371	.054	.107	.012	.286	.032
"	60 lb.	.334	.046	.040	.002	.117	.010
1 in 15	100 lb.	.329	.056	.050	.006	.195	.022
"	90 lb.	.255	.042	—	-	.135	.014
"	80 lb.	184	.028	—	—	.060	024
"	70 lb.	.113	.004	—	—	—	—
"	60 lb.	.149	.022	—	—	—	—

That the above reasoning is correct is indicated by the results obtained from an elaborate test made by the A. T. & S. F. Railway in which the complete service was recorded of 4272 chilled iron wheels placed under 534 new gondola cars of 100,000 pound capacity which were placed in service in June 1907. These wheels were made with a 1 in 15 tread taper, and after 2½ years' service, numerous wheels were critically examined to ascertain the exact amount of metal worn from the tread. Two representative sections are shown in Figure 13, A indicating the typical loss of metal from the throat, representing the wheels which are traveling close to the rail, and B representing the wheels running normally with no tendency to crowd the rail.

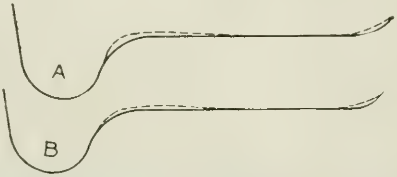


Fig. 13—Amount of tread wear, 1 in 15 cone, after 30 months' service under 100,000 lb. gondola cars.

A complete check was made monthly of all wheels removed and after four years' service but two had been removed for wearing hollow and eight for sharp flange. Three of these, however, were ground to proper contour and again placed in service. After a period of six years 80 percent of the wheels were still in service. This test is given to indicate that the heavier tapers create a condition favorable to true rolling motion and eliminates, to a great extent, the sliding of the surfaces in contact.

The remark is quite frequent that the original amount of cone is a matter of small consequence because it wears away very quickly after being placed in service. This conclusion is not borne out by results of actual tests in service where the performance is closely followed. One great difficulty in getting definite knowledge of matters of this kind is that it so often happens, where it is intended to follow tests of this kind, that enthusiasm vanishes after four or five years and the observations are discontinued. However, a large number of close observations have been made and the results invariably indicate that more service will be obtained, before the tread is worn hollow, from wheels having a large cone than from wheels with less cone. This is illustrated in Figure 14.

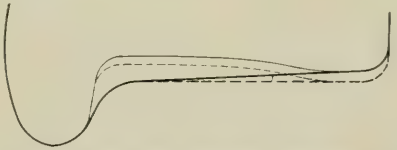


Fig. 14—Sketch illustrating the greater amount of metal available for service before wheel becomes worn hollow in a 1 in 15 taper as compared with 1 in 38.

The wearing of both flange and wheel are intensified many fold when wheel and rail are ground to the same contour, an example of which is the outer rail on curves.

An objection to heavy coning is that the vertical load is carried on an inclined surface and produces stresses in the rail that are not symmetrical. A rolling wheel develops an outward thrust on account of the cone which in some cases may cause a difference of 50 per cent between the stress in the outer and inner flange of the rail. Inclining the rail does not overcome this action.

It has often been pointed out that wheels with heavy cone produce an eccentric load on the rail, producing transverse fissures between the center and gauge line of the rail which ultimately results in rail failures. It is quite doubtful whether any improvement would be realized if the bearing were directly upon the center of the rail, for in that case the transverse fissure would merely be transferred to the center of the rail with equally fatal results.

The continuous wearing away of metal from the top of the rail between the center and gauge line finally results in a rail having an inclined top surface corresponding somewhat closely to the cone on the wheel. When in this condition the abrasion of metal and resistance to motion is accelerated because the cones cannot roll in a straight line without slippage.

Wheels with minimum cones have a bearing more nearly at the center and cause less wear on the top of the rail but increase the rapidity of wear at the gauge line on account of grinding by the flange. This also results in more rapid flange wear. The same thing is true when the rail is inclined towards the wheel to compensate for the cone. A rail in this position receives the vertical load at the center of the head while the contact with the flange is near the gauge line as shown in Figure 15. Here again the condition is developed causing a maximum loss of metal at the gauge line and minimum at the top.

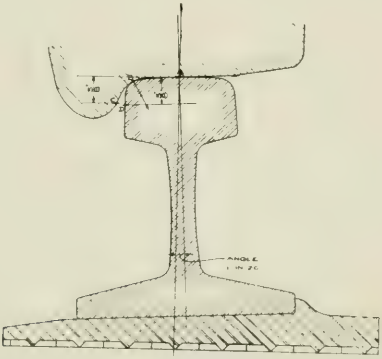
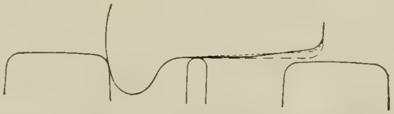


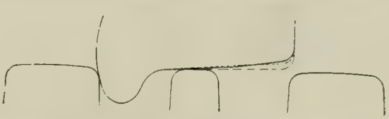
Fig. 15—Rail inclined 1 in 20 from vertical to correspond with wheel treads having a similar taper, thus placing the point of contact at the center of the rail head.

The advantages gained from inclining the rail include more symmetrical wearing of the top of rail, and a slightly reduced bending moment of axle due to moving the bearing point on the rail toward the center of the journal. It also permits mounting the wheel closer to the rail. A thicker wheel flange is also necessary to properly guard the frog point.

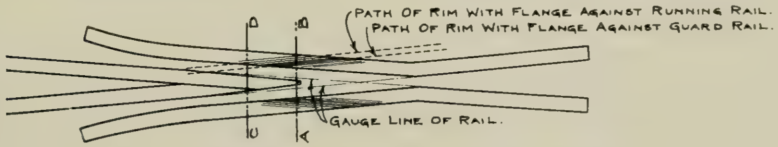
Another objection to a maximum cone is that when trailing through a frog, the entire load is carried by the narrow frog point and the load is not transferred to the wing rail until the frog point is passed. (See Figure 16). This, theoretically, in the present M. C. B. Standard, causes a vertical drop of 5/16-inch, the entire load being caught by the inner edge of the wing rail and the outer edge of the tread which produces a double injury to the frog by—First: The entire concentrated wheel load on the narrow frog point is much greater than the section of metal can sustain, and the point almost immediately, after being placed in the track, succumbs to the overload by the metal rolling out in all directions, thus allowing the transfer of load to the wing rail to take place a little sooner than if the point maintained its original elevation corresponding with the top of the rail. Second: Damage is done to the wing rail by reason of the considerable impact blow received from the dropping wheel load as it leaves the frog point. The bearing on the wing rail is very narrow and therefore the metal is rapidly cut away and a worn-



A—Showing relation of M. C. B., 1 in 38 and 1 in 13 tapers with reference to wing rail at frog point.



B—Showing relation of M. C. B., 1 in 38 and 1 in 13 tapers with reference to guard rail when width of point of rail is 1¼ in.



PATH OF RIM WITH FLANGE AGAINST RUNNING RAIL.
PATH OF RIM WITH FLANGE AGAINST GUARD RAIL.
GAUGE LINE OF RAIL.

C—Frog showing path of rims across wing rail.

Fig. 16—Illustrating Position of Wheel While Passing Through a Frog.

out frog is the result. This condition can be very materially improved if wheels had a uniform cone instead of the present double cone and if the tread was somewhat wider than the present standard.

It is self-evident that the amount of cone which is best suited for minimum abrasion to flange and rail is not the condition which produces the least stress in the rail. It is, therefore, expedient that some compromise should be made which may sacrifice some degree of service of wheel and rail for the sake of increasing the factor of safety in the rail. The whole subject of the relation of wheel taper to its action on the rail is before the A. R. E. A. for discussion and no doubt their decision will be followed by the M. C. B. Wheel Committee in their recommended practice for wheels. It is probable that it will be found very desirable to retain the 1 in 20 taper at last.

Some very sound and demonstrable reason must be given before a departure is made from the standard of the United States, Canada, England, France, Germany, Russia, China, Japan, and other countries. The subject must have a far more detailed analysis than it has ever received before so important a standard shall be changed.

The main point to observe in reducing flange and rail wear is that the throat radius shall be at least ¾-inch which was recommended by the Rail Committee 30 years ago. This will postpone the undesirable condition when the wheel and rail have the same contour, in which condition the surfaces are ground into each other instead of one rolling upon the other, in which condition the greatest rapidity of rail and wheel wear is produced. The M. C. B. Wheel Committee have made this radius $\frac{11}{16}$-inch.

Flange.

In determining the desirable flange section it is necessary to discuss the work which the flange has to perform, the intensity of lateral pressures, relation of section to flange strength, and the relation of flange to track. The method followed in the analysis of the horizontal pressures delivered to the flange was developed by A. M. Wellington and published in his book entitled "The Economic Theory of the Location of Railways."

The greatest flange pressure occurs on curved tracks. The items which develop this pressure are:

First: Forces originating in and confined in their action to the truck itself, causing the wheels to slip on the rail, which is the ultimate force of all curve resistance.

Second: Centrifugal and centripetal forces acting on the car as a whole and communicated to the truck through the center pin and side bearings.

Third: Forces due to the obliquity of traction, originating in the train as a whole and communicated to the car body and then to the trucks.

Fourth: Impacts due to high velocity and imperfections in track.

The second and third forces mentioned can only act to augment or diminish the first.

Pressure Due to Curvature.

The amount of pressure required to change the direction of the truck is represented by the resistance to lateral sliding of three wheels, the fourth acting as a pivot. This sliding is relatively at low speed and the coefficient of friction may therefore be assumed to be 25 percent. This at once determines the magnitude of the required force to be 25 percent of 3 wheel loads or 75 percent of one wheel load which is indicated graphically in Figure 17. If we assume the coefficient of friction to be constant the pressure will always be constant except as augmented or diminished by centrifugal force, obliquity of traction, impacts, oscillation, etc.

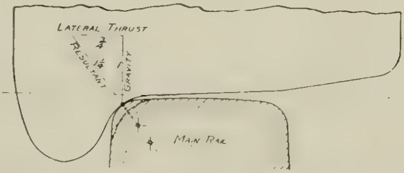


Fig. 17—Position of Wheel Developing Maximum Lateral Flange Pressure.

Regardless of how slight the curvature may be, a minute sliding is always taking place caused by the reaction of the flange and static force sufficient to cause lateral sliding of three wheels.

If this force should be continuously applied it is sufficient to cause sliding through any distance; therefore, flange pressure is independent of the degree of curvature. The distance through which it is necessary to slide the wheels increases as the degree of curvature increases, but the force remains constant. The velocity at which the train may be moving has no effect on flange pressure except that at high velocities, oscillation and other irregularities to uniform motion increase the impact blows, but the constant pressure required to guide the truck remains uniform.

The work accomplished by the flange is proportional to the degree of curve and velocity, for work done by the flange is the product of the flange pressure multiplied by the lateral distance through which it moves, and if the work is reduced to terms of horse power, the time element must be introduced, assuming that one horse power is equivalent to 33,000 foot pounds per minute. But throughout the whole problem, the pressure remains constant and is equivalent to ¾ of the load carried by one wheel, except at certain infinitesimal periods of time it may be doubled on account of impacts, etc.

Centrifugal Force.

Having established the pressure on the flange due to curvature, it is necessary to analyze the relation of centrifugal force to flange pressure.

Centrifugal force (C) in pounds per ton for any moving body at (V) miles per hour on a curve of (D) degress is

$$(C) \text{ equals } .023348\ V^2D$$

The super elevation of the outer rail creates a force tending to draw the car inward in opposition to centrifugal force. On a track of 4 feet 8½ inches gauge, the distance, center to center of rail, is approximately 59 inches, and the force tending to neutralize centrifugal force for each 1-inch elevation of the outer rail amounts to 1/59 x 2000, equals approximately 34 pounds, per ton. A maximum elevation of 8 inches would, therefore, produce an inward force of 272 pounds. In Table 6 the centrifugal force in pounds per ton is shown for various degrees of curvature at various speeds; also the superelevation of the outer rail in inches required to equalize the centrifugal force, producing a state of equilibrium.

Table 6—Centrifugal Force in Pounds per Ton on Various Curves And at Various Velocities, Also the Super Elevation of Outer Rail Required to Equalize that Force.

	1 Deg. Curve		5 Deg. Curve		10 Deg. Curve		15 Deg. Curve		20 Deg. Curve	
Miles per Hour	Pounds per Ton	Elevation Inches	Pounds per Ton	Elevation Inches	Pounds per Ton	Elevation Inches	Pounds per Ton	Elevation Inches	Pounds per Ton	Elevation Inches
10	2.33	.969	11.67	.345	23.35	.69	35.00	1.035	46.70	1.38
20	9.34	.274	46.70	1.37	93.39	2.74	140.07	4.11	186.78	5.48
30	21.01	.618	105.07	3.09	210.13	6.18	315.20	9.27	420.26	12.36
40	37.36	1.099	186.78	5.495	373.57	10.99	560.35	16.485		
50	58.37	1.717	291.85	8.585	583.70	17.17				
60	84.05	2.472	420.26	12.36						
70	114.40	3.365	572.03	18.825						
80	149.42	4.394								
90	189.12	5.563								
100	233.48	6.867								

The centrifugal force produced by a 50 ton capacity car traveling at 40 miles per hour on a 5° curve is 186 x 80=14,880 pounds, but inasmuch as the outer rail of curves on main tracks are usually elevated for passenger speeds, the flange pressure will not be increased on account of centrifugal force because the inner force, on account of the excess elevation of the outer rail, will be greater than that of centrifugal force, and for that reason, centrifugal force may be neglected as an item having any special relation to flange pressure.

Obliquity of Traction.

Obliquity of traction is often referred to as having effect on the movement of the train. The difference in angle, however, between one car and the next is so slight that the effect is entirely negligible so far as flange pressure is concerned, and in so far as it applies, it has a tendency to reduce flange pressure.

Total Flange Pressures.

Combining miscellaneous items of impacts, centrifugal force, etc., we may assume that the flange pressure at high speeds may be double the amount required for changing the direction of the truck on curves. According to this reasoning, the flange pressure in four wheel trucks amounts to the following:

Table 7—Flange Pressures on Wheels Under Cars of Various Capacities.

Size Journal	Year Axle Recommended	Car Capacity	Load on Wheel	Flange Pressure Due to Curvature	Possible Maximum Flange Pressure
—	—	20000 lbs	5000 lbs.	3750 lbs.	7500 lbs.
3¾x7	1873	40000 lbs.	8250 lbs.	6200 lbs.	12400 lbs.
4¼x8	1889	60000 lbs.	12000 lbs.	9000 lbs.	18000 lbs.
5 x9	1896	80000 lbs	16500 lbs.	12375 lbs.	24750 lbs.
5½x10	1899	100000 lbs	20125 lbs.	15100 lbs.	30200 lbs.
6 x11	1910	140000 lbs.	26250 lbs.	19700 lbs.	39400 lbs.
6½x12	—	170000 lbs.	31000 lbs.	23250 lbs.	46500 lbs.

The above table indicates the extreme rapidity with which wheel loads have grown during the period of development of modern railway equipment.

For a long period the 20,000 pound car was standard. During this period the flange contour and guard rail clearances were established. The maximum flange pressures were about 6,000 or 7,000 pounds. Since 1875 wheel loads and consequent flange pressures have developed in very rapid ratio, until today wheel loads above 30,000 pounds on wheels 33 inches in diameter are contemplated which develop flange thrusts of 45,000 pounds. These pressures must be safely resisted by the flange, and inasmuch as chilled iron wheels are designed for this service, it is essential that the factor of safety in the flange be thoroughly investigated and the flange designed proportional to the work which it is required to perform.

The maximum resistance of axles against bending in terms of flange pressure and its equivalent journal load is shown in Table 8. In general terms, the ultimate flange strength should be approximately twice the amount required to bend the axle. This information is given simply to show the approximate pressures that can be applied to the flange before the axle will bend.

Table 8—Maximum Resistance of Axles Against Bending in Terms of Flange Pressure, or Its Equivalent Journal Load.

Axle				
Size Journal	Capacity	Flange Pressure Pounds	Approximate Equivalent Journal Load Pounds	Maximum Permissible Journal Load Pounds
3¾x 7	15000	24000	58000	7500
4¼x 8	22000	33000	78000	11000
5 x 9	31000	50000	107000	15500
5½x10	38000	70000	140000	19000
6 x11	50000	100000	190000	25000
6½x12	60000	125000	230000	30000

Laws Governing Flange Strength.

On account of the widespread fallacy that the strength of flanges are not materially increased by thickening in a horizontal direction it will be necessary to analyze in detail the laws governing flange strength. A long series of tests have been made which establish the advantages of thickening the flange as compared with thickening the tread only. A summary of these results is shown in Table 9.

Table 9—Strength of Chilled Iron Flanges for Railroad and Crane Service.

Thickness of Flange	Thickness of Tread	Flange Strength Pounds
1¼ in.	1¾ in.	90,000
1¾ in.	1¾ in.	140,000
2¼ in.	1¾ in.	200,000
2¾ in.	1¾ in.	275,000
1¼ in.	2½ in.	133,000
1¾ in.	2½ in.	200,000
2¼ in.	2½ in.	275,000
2¾ in.	2½ in.	400,000
1¼ in.	3¼ in.	175,000
1¾ in.	3¼ in.	250,000
2¼ in.	3¼ in.	350,000
2¾ in.	3¼ in.	500,000
1½ in.	5 in.	400,000
2 in.	5 in.	600,000
2½ in.	5 in.	800,000
3 in.	5 in.	1,000,000

Flange failures are of two kinds. First, where the fracture follows the grain of the chill through the throat of the wheel, extending entirely through the tread and finally through the flange section at both ends of the fracture as shown in Figure 18.

In this case, if we compare the section with that of a structural shape known as an angle, the failure occurs in both legs. It is this class of failures which the M. C. B. Wheel Committee dwell upon in their 1916 report to the exclusion of all other failures. There is a second class of failures, however, which is just as important and must not be allowed to escape attention.

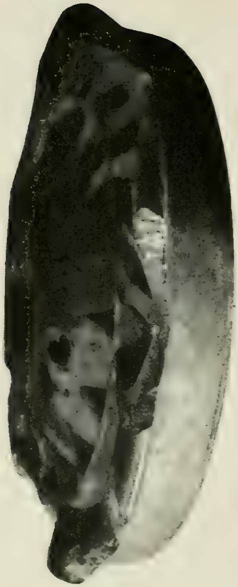


Fig. 18—Normal Direction of Fracture in New Flange.

and that is when the fracture occurs in the flange section alone which represents but one leg of the angle. This is shown in Figures 19, 20 and 21.

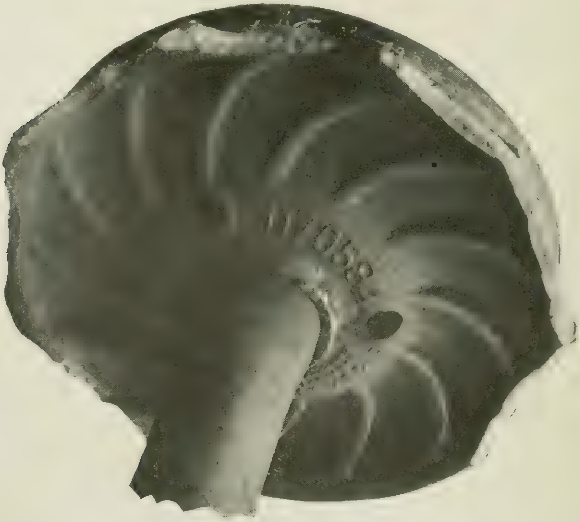


Fig. 19—Fracture Through Flange and Not Through Tread.

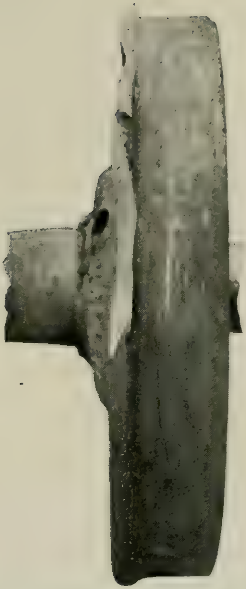


Fig. 20—Characteristic Fracture of Thin Flange.

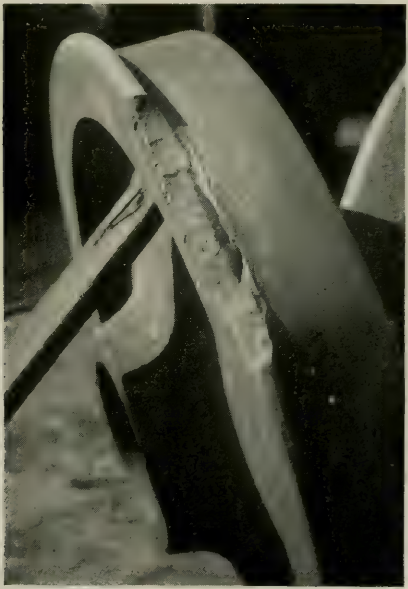


Fig. 21—Flange Fracture—Steel Wheel.

Consideration of the method in which flanges fail is very important and must be thoroughly mastered before proper designing can be established. The greatest strength of flange is developed with a minimum of metal when the fracture occurs through both legs of the angle represented by the flange and tread. This at once suggests that to obtain the greatest economy in metal there must be a certain relation between flange thickness and tread thickness. Figure 22 shows fractures from several different designs, having on one one side of the wheel a thin tread with no brackets, while on the opposite side the tread is made of excessive thickness.

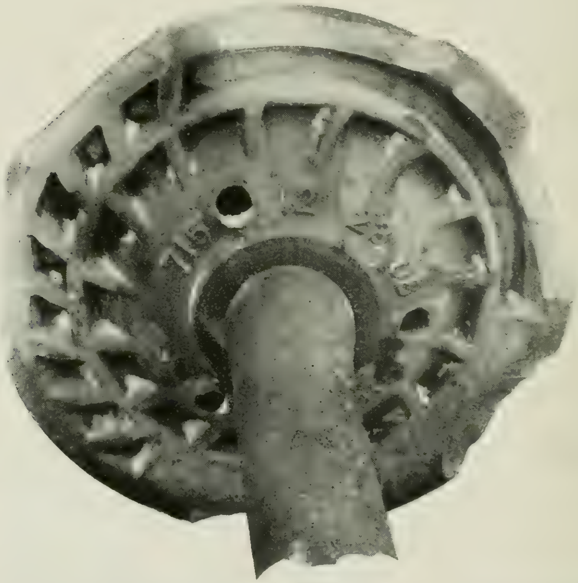


Fig. 22—Various Flange and Tread Fractures. Also Illustrating a Bent 100,000 lb. Capacity Axle Resulting From Flange Pressure.

The fracture in the case of the thin thread occurred at almost 100,000 pounds pressure, the flange breaking through the tread with a comparatively long fracture. On the opposite side with a very thick tread the fracture occurred through the flange only, fracture occurring at 136,000 pounds which was sufficient to bend the axle. It is self-evident that where the amount of metal used is not taken into consideration that the maximum strength of flange is developed when the tread is so deep that the fracture occurs in a saucer shape in the back of the flange only. The depth at which the fracture extends through the back of the flange depends upon the flange thickness at the point to which the pressure is applied. Obviously, a thin flange having a fillet where it joins the tread will break at a very different angle than a new thick flange with an ample fillet. This is so apparent that it would seem to require no elaboration but the opposite theory has been put into print through M. C. B. Association which makes it necessary to dwell more at length on the strength of thin flanges and fractures which do not extend through the tread.

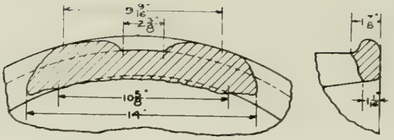
Figure 23 shows the direction of fracture of a new M. C. B. flange of various tread thickness, A having 1¾ inch thickness of tread, B, 2½ inches and C, 3¼ inches. It will be noted that A and B extended entirely through the tread whereas in C the fracture did not extend through the tread, indicating that no advantage is gained by increasing the tread thickness much beyond 2½ inches for a flange 1¼ inch. Were it not for the fact that the throat fillet of the flange is worn away and the flange reduced in thickness, the ratio of flange thickness to tread thickness would doubtless be as 1 to 2. Taking into consideration, however, the fact that is it the worn flange that must be considered, the thickness of the tread should be twice the thickness of the flange when worn out. Something less than this ratio produces the greatest economy in metal and we may establish a proportion of 2 to 3.

In the M. C. B. Wheel Committee Report for 1916, the following comment is made:

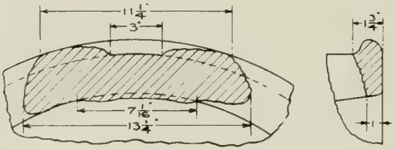
> "Failures of flanges of cast iron wheels under fair usage other than those caused by circumferential seams are so rare as to be almost unknown."

The "Railway Review," referring to the Committee's report, comments as follows:

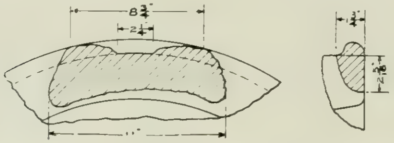
> "Rightly viewed, this Committee's report is the highest possible encomium upon the chilled iron wheel."



A—Flange 1¼ in. Thick, 1¾ in. Through Throat.



B—Flange 1¼ in. Thick, 2½ in. Through Throat.



C—Flange 1¼ in. Thick, 3¼ in. Through Throat.

Fig. 23—Pieces of Flange Broken Out of 33 in. Wheels in Test Illustrating How the Direction of Fracture Varies as the Throat Thickness Is Increased.

Notwithstanding this highly satisfactory result, the same report, Exhibit A, here shown in Table 10, shows that flange failures gravitate toward the cars of heavy capacity as summarized in Table 11.

It is obvious from this report that the flanges on the wheels under 100,000 pounds capacity cars are not relatively as strong as the flanges on wheels under 60,000 pounds capacity cars. Furthermore, if there are any broken flanges on the 625 pound wheels operating under cars whose gross load is 95,000 pounds, we must reasonably expect a greater number of broken flanges on 725 pound wheels which operate under cars having a gross weight of 161,000 pounds, when the flange thickness is the same on both wheels, the only difference being a slight thickening of tread in the 725 pound wheel. With this increase in percentage of broken flanges, a still further increase will occur if the present M. C. B. flange is adopted for the new 875 pound wheel for

Table 10—Number Broken Flanges Reported. Thickness of Flanges at a Point ⅜ in. Above Tread.

Weight of Wheels	Year Cast	Less than 15/16 in.	15/16 in to 1 in.	Over 1 in. to 1 1/16 in.	Over 1 1/16 in. to 1⅛ in.	Over 1⅛ in. to 1 3/16 in.	Over 1 3/16 in. to 1¼ in.	Over 1¼ in.	Totals
625	1915								
	1914	1							1
	1913							1	1
	1912	1			2		2		5
	1911							1	1
	1910				1			1	2
	1909		1						1
	Total	2	1	—	3	—	2	3	11
675	1915								0
	1914						1		1
	1913		2	1	1		2		6
	1912			1	1	2	2		6
	1911			1					1
	1910		2						2
	1909			3					3
	Total		4	6	2	2	5	—	19
725	1915								0
	1914			2	1	2		2	7
	1913		2	2	5	6	2	2	19
	1912		1	11	5	3	5		25
	1911		1	4		1	2		8
	1910			6	1	3	2	2	14
	1909								0
	Total	—	4	25	12	15	11	6	73

Table 11—Percentage of Cars in Service and Flange Failures.

	Weight of Wheel Lbs.	Percentage of Cars in U. S.	Total No. of Flange Failures Reported
60,000 lbs. capacity and under	625	44%	11
80,000 lbs. capacity	675	29%	19
100,000 to 120,000 lbs. capacity	725	27%	73

cars of 85 tons capacity. The question of flange thickness should be considered in a broad sense as an engineering problem, which requires a unit of metal to be added for each increase in requirement. The M. C. B. Wheel Committee were not referring to the design of flanges for 85 ton capacity cars.

It will be noted that there is an increasing number of failures as the flanges grow thin. The M. C. B. condemning limit for flange thickness under cars of 80,000 pounds capacity and 100,000 pounds capacity is 1 inch and under cars of 60,000 pounds capacity is $\frac{15}{16}$-inch. There should be no wheels in service with flanges below this limit, although two are shown in the 60,000 pounds capacity class, four in the 80,000 pounds capacity class and four in the 100,000 pounds capacity class. These doubtless represent a very large percentage of wheels in service of this character. Confining our analysis to 725 pound wheels there were but six broken flanges in new wheels, as compared with 25 when worn to the condemning limit, and since not more than 10 percent of the wheels which went into service have flanges worn to this extent, it is fair to assume if all of the wheels had flanges reduced to 1 inch in thickness there would have been 250 failures instead of 25. Furthermore, if $\frac{3}{16}$-inch of metal had been added to the backs of these flanges the condemning limit would have been $1\frac{3}{16}$-inch instead of 1-inch and inasmuch as 56 of 73 flanges passed the $1\frac{3}{16}$ stage without breaking, all of these failures would have been avoided. And it is reasonable to suppose that if $\frac{3}{16}$-inch had been added to the backs of the remaining 17 flanges that considerable percentage would not have failed.

Wheels having normal flange thickness seldom break unless a seam is present to weaken the metal. When seams are present extending through the tread the safety of the flange depends

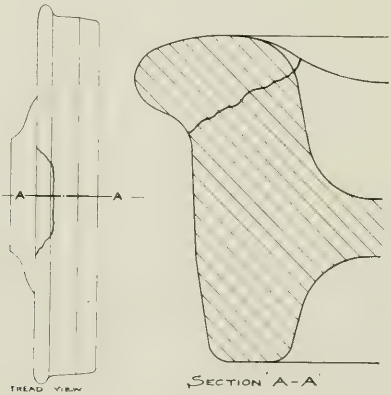


Fig. 24—Sketch Showing Line of Fracture on Wheel With Broken Flange.

upon the metal represented by the thickness of the flange, for the fracture must extend through the flange at two points before a piece can be broken out. This is illustrated in the tread view in Figure 24. It is very essential in wheels of this character that the thickness of flange should be as great as possible, in order that the flange may be maintained intact a sufficient length of time to allow the defect to be detected and removed from service. From every point of view it is desirable to use the maximum flange thickness permitted by track clearances. It is not only true that the 3/16-inch flange thickness can be obtained, but it is almost certain that another 1/8-inch could be secured if there was a united effort in this direction, culminating in a request to the A. R. E. A. to adopt 1 7/8-inch as the clearance between running rail and guard rail which is already used to a large extent.

Assuming that the present M. C. B. flanges do not possess an adequate factor of safety for wheel loads above 20,000 pounds it is highly important that the question of flange section should receive the attention which its economic importance demands. As far as bearing value is concerned, chilled iron is greatly superior to rolled steel and there are no restrictions which prevent making the body of the wheel as strong as may be required, and inasmuch as the flange is the only part that is restricted, it is important that this vital part of the wheel shall receive more attention at the hands of the M. C. B. than is indicated in their proceedings.

The maximum flange pressures which develop in service have been shown in Table 7, Page 238 and these may be accepted as being approximately correct, at least until more experimental data is at hand. There are a good many items which may counteract the impact blows such as taper on a wheel or the fact that a wheel must slide laterally before instantaneous flange pressure can be developed. Hence, flange pressures are ordinarily less than given in the table rather than more.

In choosing a flange for any given service it is only necessary to fix upon the desired factor of safety and choose from Table 12 the flange having the required strength.

In ordinary railroad practice a factor of four in a new flange as compared with a maximum momentary impacts which are possible to develop in service, constitutes good practice. It is

Table 12—Approximate Dimensions of Flange and Tread Sections Required to Secure the Safety Factors Shown. The Thickness of Flange Shown for the Lower Factor is the Present M. C. B. Standard.

Car Capacity	Flange Strength Required: Safety Factor of 4	Flange Strength Required: Safety Factor of 5	Flange and Tread Thickness Required: Safety Factor of 4 (Flg. Trd.)	Flange and Tread Thickness Required: Safety Factor of 5 (Flg. Trd.)
60,000 lbs.	72,000 lbs.	90,000 lbs.	1¼ x 1¾	1⅜ x 1¾
80,000 lbs.	100,000 lbs.	125,000 lbs.	1¼ x 1⅞	1½ x 2
100,000 lbs.	120,000 lbs.	150,000 lbs.	1¼ x 2¾	1⅝ x 2⅜
140,000 lbs.	160,000 lbs.	200,000 lbs.	1¼ x 3	1¾ x 2¾
170,000 lbs.	185,000 lbs.	230,000 lbs.	1¼ x 3¼ 1¾ x 2½	1¾ x 3

possible, however, to obtain a factor of five. To maintain good proportions this requires flanges of the approximate dimensions shown in Figure 25.

Track Clearances

Having chosen the flange which is proportional to the heaviest load now carried or likely to be carried in the near future, it remains to examine the relation between flange and track to determine the relation which shall be most harmonious from both the wheel and track standpoint.

The first item to be considered is the normal position of the wheel with reference to the running rail. This requires a knowledge of the rail sections commonly used in track, nearly all of which can now be classified in weights of from 60 pounds to 125 pounds and in type include the A. S. C. E., A. R. A. "A" and A. R. A. "B". Table 12 shows the dimensions for sections of 100 pounds per yard and under. Figure 26 shows the present M. C. B. flange and tread contour.

The bearing points on the rail have already been explained and illustrated in Figure 10, Page 228. The normal position of the wheels should be such that lateral motion is controlled within reasonable limits and that there shall be no grinding at point B on both wheels of a pair at the same time. On account of the rough manner in which cars are manufactured and friction in

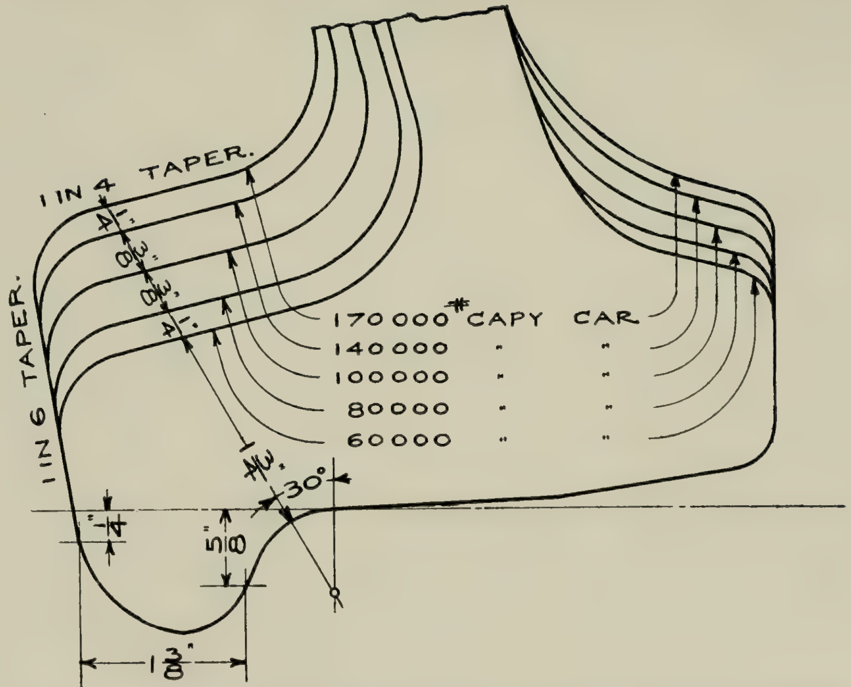
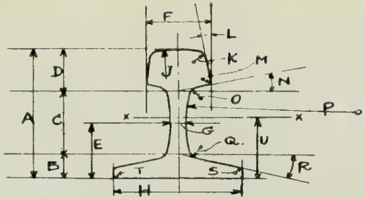


Fig. 25—Dimensions of Well Proportioned Flange Sections Having Adequate Strength for Each Respective Service.

Table 13.

DIMENSIONS AND PROPERTIES OF STANDARD RAIL SECTIONS.



TYPE	WEIGHT	HEIGHT A	HEIGHT OF BASE B	HEIGHT OF WEB C	HEIGHT OF HEAD D	CENTER OF WEB E	WIDTH OF HEAD F	THICKNESS OF WEB G	WIDTH OF BASE H	RADIUS OF HEAD J	CORNER RAD, HEAD K	TAPER SIDE OF HEAD L	BOTTOM RAD, HEAD M	TAPER BOT. OF HEAD N	TOP RAD OF WEB O	MIDDLE RAD, WEB P	BOTTOM RAD, WEB Q	TAPER OF BASE R	TOP RAD OF BASE S	BOTTOM RAD, BASE T	AREA SQ IN	AREA RATIO.			HEIGHT OF NEUTRAL AXIS U	AXIS X – X				
																						HEAD	WEB	BASE		MOM OF INERT.	SECTN MODULUS.	RAD GYR HEAD	RAD GYR BASE	
ARA A	100	6	1 1/16	3 3/8	1 9/16	2 3/4	2 3/4	9/16	5 1/2	14	3/8	1 IN 16	1/16	1 IN 4	3/8	14	3/8	1 IN 4	1/16	1/16	9.80	36.9	23.4	39.7	2.75	48.94	15.04	2.19	2.29	
"	90	5 5/8	1	3 5/32	1 15/32	2 37/64	2 9/16	9/16	5 1/8	14	3/8		1/16		3/8	14	3/8		1/16	1/16	8.82	36.2	24.0	39.8	2.54	38.70	15.26	1.92	2.03	
"	80	5 1/8	31/32	2 23/32	1 7/16	2 21/64	2 1/2	23/64	4 5/8	14	3/8		1/16		3/8	14	3/8		1/16	1/16	7.84	38.8	21.0	40.2	2.31	28.80	10.24	1.74	2.01	
	70	4 3/4	29/32	2 1/2	1 11/32	2 5/32	2 3/8	1/2	4 1/4	14	3/8		1/16		3/8	14	3/8		1/16	1/16	6.86	39.6	21.8	38.9	2.20	21.05	8.21	1.67	1.79	
"	60	4 1/2	13/16	2 29/64	1 15/64	2 5/128	2 1/4	15/32	4	14	3/8		1/16		3/8	14	3/8		1/16	1/16	5.88	37.7	24.1	38.2	2.13	15.41	6.50	1.68	1.64	
ARA B	100	5 41/64	1 5/64	2 55/64	1 45/64	2 65/128	2 21/32	9/16	5 9/64	12	3/8	3°	1/16	13°	5/16	12	5/16	13°	1/16	1/16	9.85	40.2	19.2	40.6	2 5/8	41.3	13.70	2.01	2.15	
"	90	5 17/64	1 1/32	2 5/8	1 39/64	2 11/32	2 9/16	9/16	4 49/64	12	3/8	3°	1/16	13°	5/16	12	5/16	13°	1/16	1/16	8.87	40.1	19.2	40.7	2 52/128	32.3	11.45	1.98	1.85	
"	80	4 15/16	1	2 15/32	1 15/32	2 15/64	2 7/16	35/64	4 7/16	12	3/8	3°	1/16	13°	5/16	12	5/16	13°	1/16	1/16	7.81	38.8	19.5	41.7	2 35/128	25.1	9.38	1.87	1.72	
"	70	4 35/64	59/64	2 17/64	1 23/64	2 7/128	2 3/8	33/64	4 3/64	12	3/8	3°	1/16	13°	5/16	12	5/16	13°	1/16	1/16	6.89	40.1	19.5	40.4	2 5/32	18.6	7.79	1.71	1.60	
"	60	4 3/16	7/8	2 1/16	1 1/4	1 29/32	2 1/8	31/64	3 11/16	12	3/8	3°	1/16	13°	5/16	12	5/16	13°	1/16	1/16	5.87	38.8	19.4	41.8	1 61/64	13.3	5.90	1.58	1.46	
ASCE	100	5 3/4	31/32	3 5/64	1 45/64	2 65/128	2 3/4	9/16	5 3/4	12	5/16	NO TAPER.	1/16	13°	1/4	12	1/4	13°	1/16	1/16	9.80	42	21	37	2.8	43.8	14.6	2.19	2.05	
"	95	5 9/16	15/16	2 63/64	1 41/64	2 55/128	2 11/16	9/16	5 9/16	12	5/16		1/16	13°	1/4	12	1/4	13°	1/16	1/16	9.31	42	21	37	2.7	38.6	13.3	2.11	1.98	
"	90	5 3/8	59/64	2 55/64	1 19/64	2 45/128	2 5/8	9/16	5 3/8	12	5/16		1/16	13°	1/4	12	1/4	13°	1/16	1/16	8.82	42	21	37	2.5	34.0	12.0	2.04	1.92	
"	85	5 3/16	57/64	2 3/4	1 35/64	2 17/64	2 9/16	9/16	5 3/16	12	5/16		1/16	13°	1/4	12	1/4	13°	1/16	1/16	8.33	42	21	37	2.5	30.0	11.0	1.97	1.85	
"	80	5	7/8	2 5/8	1 1/2	2 3/16	2 1/2	35/64	5	12	5/16		1/16	13°	1/4	12	1/4	13°	1/16	1/16	7.84	42	21	37	2.4	26.2	10.0	1.90	1.78	
"	75	4 13/16	27/32	2 35/64	1 27/64	2 15/128	2 15/32	17/32	4 13/16	12	5/16		1/16	13°	1/4	12	1/4	13°	1/16	1/16	7.35	42	21	37	2.4	22.9	9.3	1.83	1.72	
"	70	4 5/8	13/16	2 15/32	1 11/32	2 3/64	2 7/16	33/64	4 5/8	12	5/16		1/16	13°	1/4	12	1/4	13°	1/16	1/16	6.86	42	21	37	2.2	19.6	8.2	1.76	1.65	
"	65	4 7/16	25/32	2 3/8	1 9/32	1 31/32	2 13/32	1/2	4 7/16	12	5/16		1/16	13°	1/4	12	1/4	13°	1/16	1/16	6.37	42	21	37	2.2	16.9	7.4	1.68	1.58	
"	60	4 1/4	49/64	2 17/64	1 7/32	1 115/128	2 3/8	31/64	4 1/4	12	5/16		1/16	13°	1/4	12	1/4	13°	1/16	1/16	5.88	42	21	37	2.1	14.5	6.7	1.71	1.85	ILL ST. CO. NO.
D.&R.G.	65	4 3/8	47/64	2 1/8	1 33/64	1 51/64	2 1/2	7/16	4 3/8	12	5/16	3 1/4 RAD AT 5/16 BEL. TOP.		13°	1/4	8	1/4	13°	1/8		6.37	51	17	32	2.34	17.0	7.25	1.41	1.86	6503
CHICAGO R.T.Co.	90	5	7/8	2 11/32	1 25/32	2 45/64	2 7/8	11/16	5	12	1/2	8°	1/8	13°	1/4	9	1/4	13°	5/32		8.82	47	21	32	2.6	29.9	11.5	1.76	2.34	9001
CB&Q	85	5 3/16	7/8	2 1/2	1 13/16	2 1/8	2 9/16	1/2	5	11	3/8	5" R. 1 5/16 B.T.	1/8	15°15'	3/8	8	1/2	14°2'	1/8	1/8	8.33	48	18	34	2.68	32.4	12.1	1.63	2.01	8502
G.N	75	5	25/32	2 1/2	1 23/32	2 1/32	2 7/16	9/16	4 3/4	10	5/8	6°	1/8	14°	1/4	12	1/4	14°	ONE RAD NOT SPEC.		7.35	48	21	31	2.66	24.6	9.26	1.62	2.08	7507
C.M. & ST.P.	75	4 3/4	7/8	2 21/64	1 35/64	2 5/128	2 1/2	17/32	4 3/4	18" 5°48' 3/4" 12°6'	1/4	0°	1/16	15°	5/16	ST LINE	5/16	15°	3/16" TANG AT TOP.		7.35	46	18	36	2.44	25.1	10.3	1.65	1.93	7502
CK.I.P.	70	4 1/2	51/64	2 5/64	1 5/8	1 7/16	2 1/4 AT TOP	1/2	4 1/2	10	5/8	10°	3/16	14°	1/4	9	1/4	14°	1/8		6.86	50	17	33	2.40	19.9	8.30	1.48	1.88	7003
SANTA FE.	56	4 1/4	21/32	2 1/32	1 9/16	1 43/64	2 3/16 BOT. AT 2 1/8 RAD	3/8	3 3/4	14	3/8	1/32" IN 7/8"	1/8	14°	1/4	ST LINE	1/4	14°	1/8"	SHARP NO. RAD.	5.49	54	17	39	2.19	15.5	7.27	1.45	1.73	5611

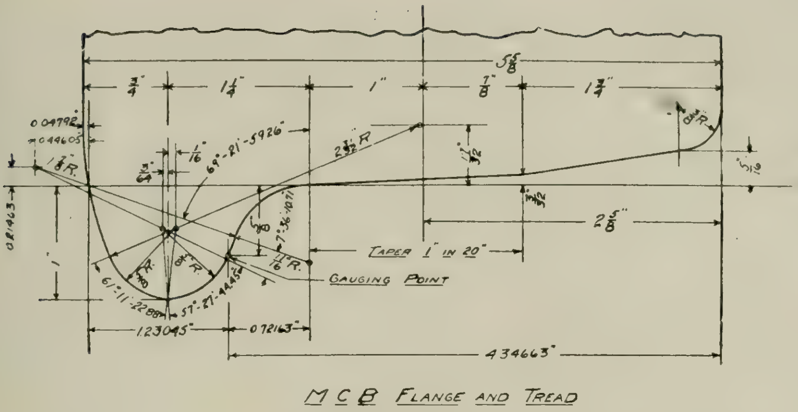


Fig. 26—Detailed Dimensions of the Present M. C. B. Standard Flange and Tread.

center and side bearings, the inequality in circumference of wheels, irregularities in track and many other items make a combination which results in the tendency of one wheel or the other to run close to the rail, requiring lateral pressure at B to correct its alignment. In other words, a wheel when crowding the rail does not assume a position parallel to the rail but presents a slight angle which requires continual correction by lateral flange pressure.

The first item to be determined is the relation of the gauge point of the wheel D to the gauge of the rail C when the wheel first comes in contact at B. This position has been calculated for different sections of rail and different tread tapers, and the distance C—D recorded in Table 14.

The position of wheel has also been calculated for the various rail sections, the wheel having 1 in 20 cone with the rail inclinded from the vertical at an angle of 1 in 20. A further extension of the table shows the distance C—D for the forward wheel of the truck when engaging the rail on a curved track in the position shown in Figure 17, Page 235.

Table 14—Distances from Gauge Point on Rail (C) to Gauge Point on Wheel (D) When Lateral Resistance is First Encountered at B, Calculated for Various Tread Tapers on Standard Rail Sections.

Rail Vertical.

	100 Lb.	90 Lb.	80 Lb.	70 Lb.	60 Lb.
NO CONE					
A. R. A. Series B	.19271	.19889	.20715	.21060	.22951
A. R. A. Series A	.19381	.20602	21020	.21823	.22622
A. S. C. E.	.22632	.23641	.24671	.25187	.25712
CONE 1-24					
A. R. A. Series B	.25843	.26509	.27307	.27777	.30419
A. R. A. Series A	.26202	.27221	.28280	.29744	.29619
A.S. C. E.	.29181	.30265	31353	.31899	.32450
CONE 1-20					
A. R. A. Series B	.26716	.27396	.28264	.28484	.30608
A. R. A. Series A	.27632	.28942	.29383	.30232	.31057
A. S. C. E.	.30545	.31655	.32747	.33296	.33849
CONE 1-15					
A. R. A. Series B	.29317	.30055	.30905		
A. S. C. E.	.33343	.34454	.35564	.36100	.36529
Rail inclined 1 in 20 from vertical					
CONE 1-20					
A. R. A. Series B	.18876	.19503	.20335	.20875	.22558
A. R. A. Series A	.18999	.20219	.20630	.21337	.22236
A. S. C. E.	.22236	.23253	.24281	.24800	.25322

Position of Wheel When Lateral Pressure is Developed.

Figure 10, Page 228, shows position of wheel when the first lateral resistance is offered by the rail. If the tendency of the wheel is to run toward the rail, a sufficient amount of pressure must be exerted to change this direction. In this case part of the vertical load will be transferred to the point "B" until the final resultant of the vertical load and lateral resistance will be combined at the point shown in Figure 17, Page 235, which is the position of the forward outside wheel for a four wheel truck when traveling around a curve. In this position the distance between gauge and rail is as follows:

A. R. A. Series B, all weights	.1471
A. R. A. Series A, all weights	.1444
A. S. C. E., all weights	.18413

Position on Rail.

In reviewing the Table it will be noted that for the ordinary weight of rail in the A. R. A. sections with cone on the wheel of 1 in 20, that lateral resistance begins when the distance between the gauge point of the wheel to the gauge of the rail is from .26 to .29 inches, depending upon the rail section. In case the rail is inclined from the vertical at an agle of 1 in 20, this distance is reduced by approximately .08 inches which allows that much more lateral play on both sides or a total of approximately 3/16 inches. If the same lateral play is allowed, the flange may be increased in thickness by ⅛-inch or a total of 5/16-inch.

The positicn of wheels when mounted should be such that when in normal position on the rail, the distance between wheel and rail gauging points is ot less than .28 or .29 inch. If less than this, there will at times be an opportunity for unnecessary bearing at the throat fillet and if this distance is exceeded, there will be an undesirable amount of lateral play which increases as the wheel and rail become worn. In order to assume the nearest fractional part of an inch we may take .315 or 5/16-inch as an ideal position. The difference between the normal position of the flange and the position when pressing against the rail, will give the amount of lateral play on each side. When the wheel is new and the rail new, this distance is represented by .315 minus .145 equals .170 inch or nearly 3/16-inch. The total lateral play of new wheels on new rail with perfect track therefore becomes ⅜-inch. As the rail becomes worn down on the gauge side and the wheel becomes worn in the throat, more and more lateral play is secured until the flange is worn vertical, when the lateral play may become as much as ¾-inch with a 4-foot 8½-inch track gauge.

The present M. C. B. mounting calls for the distance C—D to be 13/32-inch which permits 3/16-inch more lateral play than proposed above. In other words, it is believed to be better practice to mount the wheels 3/32-inch nearer to the rail than called for in the present M. C. B. specifications.

The thickness of the flange must be such that the back of the flange will engage the guard rail to prevent the mate wheel from encroaching on the point of the frog. This dimension is called the check gauge distance and is established in the M. C. B. Rules at 4 feet 6-29/64 inches. This dimension is shown in Figure 27 when the back of the thickened flange and the M. C. B. flange coincide on one side and the throats of the two flanges coincide on the other.

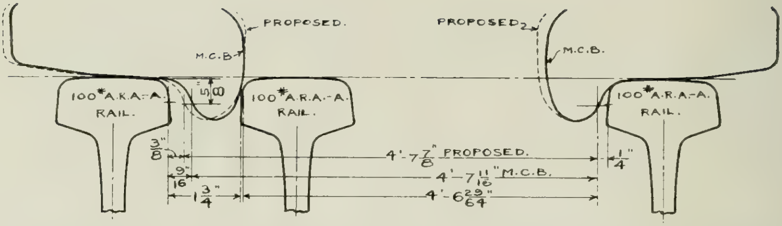


Fig. 27—Relative Positions of M. C. B. and Proposed Flanges With Reference to Guard Rail.

Since the check gauge distance is a constant quantity and the normal position of the flange fixed at 5/16-inch from the rail, all the other dimensions for gauging the wheels become fixed automatically by the following rules:

> Wheel gauge (4 feet 8½ inches) equals track gauge (4 feet 7⅞ inches) minus twice the distance C—D (5/16-inch) See Figure 27, Page 254.
>
> Flange thickness (1-27/64-inch) equals wheel gauge (4 feet 7⅞ inches) minus check gauge (4 feet 6-29/64 inches).

In order to clear the above standard from small fractions, 1/64-inch should be added to the thickness of flange, making it 1 7/16-inch thick at the base line. It is permissible to allow the back of flange to increase in thickness above the rail line at a rate of 1 in 6. This will produce flanges as shown in Figure 25, Page 249, which will comply with all the requirements of good engineering practice with reference to the maintenance of flange strength in proportion to the increased demand. That flanges of the above dimensions are entirely feasible has been proven on various railroads where the action of the flange and guard rail have been closely observed and in no case have any objectionable conditions been encountered. In fact where the subject has been given the most careful attention, the flange has received enthusiastic commendation and is being extended into all classes of equipment. All that is now required for introducing a flange with a radical increase in the factor of safety is for the M. C. B. Association to say to the A. R. E. A. that this would be a desirable improvement.

The official proceedings of the M. C. B. Association and the A. R. E. A. relating to this feature are as follows:

Extract of report of Wheel Committee to M. C. B. Association at 1912 Convention:

> "The question of increasing the thickness of the flange and mounting the wheels ⅛-inch apart is a matter which this committee can not pass upon or recommend. It was suggested that the Association of Manufacturers of Chilled Car Wheels refer this question to the American Railway Association, as it will involve clearances in frogs and crossings, etc.
>
> "If it should be found advisable after investigating this matter with the American Railway Engineering Association, the Committee will report on this at some future time."

This subject was presented by the Chairman of the Wheel Committee to the M. C. B. Association at the 1913 convention as follows:

> "The wheel manufacturers have asked repeatedly to be allowed to increase the thickness of flange ⅛-inch, this ⅛-inch of metal to be placed on back of the flange and below the tread line, or between the tread line and the center of the wheel, and your committee has not acted on this request from the fact that such increase would interfere with road conditions in regard to clearance of frogs, switches and crossings.
>
> "We believe that with ⅛-inch more clearance in frogs, crossings and switches, the manufacturers of chilled cast iron wheels can produce a wheel that will be perfectly safe and one which will yield more economical service than any wheel on the market, and I again recommend that the matter be taken up by this Association with the American Railway Association with regard to getting an increased clearance in frogs, crossings and guard rails."

In the 1916 Proceedings of the American Railway Engineering Association we find the following in regard to the subject:

> "The Sub-Committee has done some very thorough work. They came to a conclusion, but the Track Committee has not had time to consider it thoroughly enough to make a recommendation. The Track Committee sees no reason why the flange of the car wheels should not be thickened

as desired, and this can be done without any increase in the flangeway by closing in a little on the distance between the gage of the wheel and the gage of the track so as to allow a little less play."

The above official proceedings show that the M. C. B. Wheel Committee in 1912 and also in 1913 strongly urged the Association of Manufacturers of Chilled Car Wheels to take up the question of flange clearance in frogs and crossings with the American Railway Association. This was done and a special Sub-Committee was appointed by the A. R. E. A. which thoroughly investigated the subject and reported that $\frac{3}{16}$-inch thickening of the flange at the rail line will not interfere with present track clearances. At this point the M. C. B. Wheel Committee advised the Sub-Track Committee of the A. R. E. A. that nothing would be gained in the interests of safety or economy by thickening the flange as recommended. This action on the part of the M. C. B. Wheel Committee virtually withdrew the request of the M. C. B. Association and left the A. R. E. A. with nothing to investigate. The Committee was, therefore, relieved of further consideration of the subject.

However, interest in thickening the flange has not been dropped as is indicated by the large number of requests for the introduction of the flange with the full $\frac{3}{16}$-inch increased thickness for trial purposes. Many highly favorable comments have been made by those who have used them.

It is unfortunate that, after spending two or three years getting the machinery for this investigation into motion, the question could not have been settled on its merits instead of assuming that no good would be accomplished by establishing track limitations to flange thickness. The whole subject will have to be re-opened at some future time because so important an engineering proposition cannot be permanently disposed of in such a superficial manner.

The foregoing analysis shows that there is no track difficulty in designing a flange that will harmonize with track for any desired factor of safety for any load that can be carried by the rail—the engineering obstacles are so infinitesimal that an argument would seem unnecessary were it not for the facts to the contrary.

Experimental Determination of Stress.

The A. M. C. C. W. have made arrangements with the University of Illinois to determine as far as possible all the fundamental relations of stresses which are developed in service and the resultant strains in each part of the wheel. This is an undertaking of huge magnitude, requiring continuous testing over a period of two to three years. It must be remembered that there is no information regarding any of the properties of chilled iron, and each test must be checked and re-checked in order to avoid erroneous conclusions.

The program includes the critical examination of a wide variety of specimens to determine the specific gravity, average modulus of elasticity, coefficient of expansion and the relation of deformation for increasing increments of load. No reliable data of this nature is now available.

The test pieces for this part of the investigation consist of bars cut from various parts of the wheel, and also from test blocks cast for the purpose. Wheels of various weights and contours are tested to determine the stresses developed by pressing on the axle. This will include rough machining, moderately accurate machining and accurate machining, taper fits, etc. After the wheels are pressed on they are tested with a vertical load to a point where the surface of the rail crushes. This occurs at about 200,000 pounds. The strains are measured on the vertical and horizontal diameters and on the 45° lines at approximately 100 different points on the outside and inside of the wheel.

The strength of flanges of various sections, both new and worn, are to be investigated; also the stresses developed in the plate of the wheel by various flange pressures. The heat stresses within the wheel for various shoe pressures at various velocities is the most important part of the program and requires by far the greatest length of time for investigation.

This test carries with it investigation of the coefficient of friction of brake shoes for various velocities continuously applied, the work done under these varying conditions and the relation of shoe loss to work done under widely varying pressure and velocity. When this work is completed, much light will be thrown upon the relation of stresses to various service conditions and the most economical design to meet the extremes of service will be established.

This work has been under way for a year but the time has largely been spent in devising ways and means for working out all variety of tests, which in connection with the unsettled industrial conditions has prevented rapid consecutive investigation. It will not be out of order to give some of the preliminary results as an indication of the economic importance of this investigation.

Stresses Developed by Vertical Static Loads.

Figure 28 shows part of the 600,000 pound testing machine at the University of Illinois with a pair of wheels in place to receive the vertical load as nearly as possible corresponding to service conditions. The face of the wheel indicates points at which measurements are taken to record the deformation of the

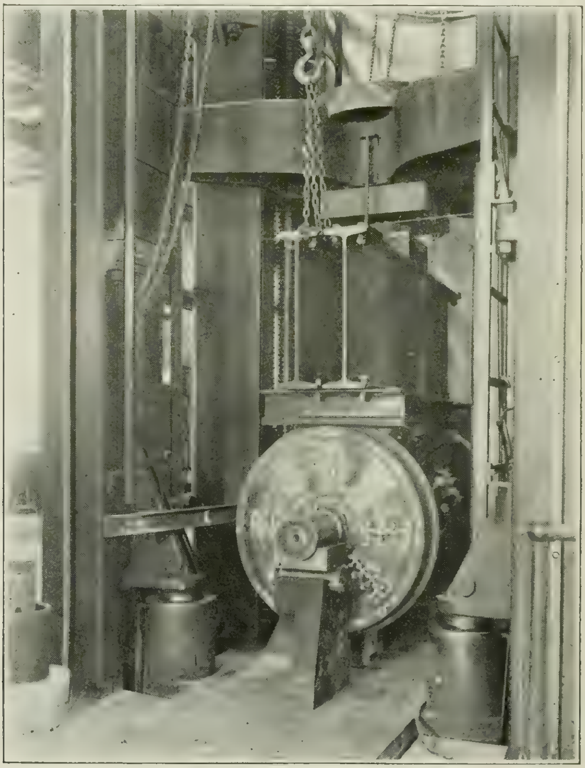


Fig. 28—View of the 600,000 Lb. Testing Machine at the University of Illinois With a Pair of Wheels in Position to Receive Vertical Load.

metal under various loads. Any load, however slight, causes a distortion in the metal which supports it and the relation between load and distortion or between stress and strain, as it is technically called can be established so that measuring the distortion determines the load or vice versa, knowing the load, the distortion in the metal can be calculated.

The strains are measured in ten thousandths part of an inch at intervals of 2 inches in both the radial and tangential directions. The relation between stress and strain for tensile stresses in steel and wheel iron are shown in Figure 29, and by referring any observed deformation to this diagram, the stress per square inch is obtained.

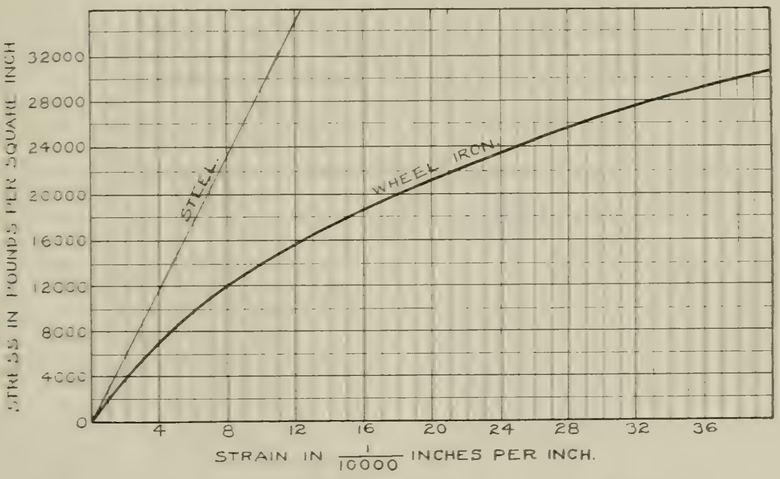


Fig. 29—Relation Between Tensile Stress and Strain for Steel and Wheel Iron.

Figures 30 and 31 indicate the compressive and tensile strains in a 725 pound M. C. B. wheel under a vertical load of 200,000 pounds corresponding to ten times the maximum wheel load under 50 ton capacity cars. It will be noted that the strain in the outside plate of the wheel is very much larger than in the reverse side. However, even in the outside plate, the stresses developed by this load are insignificant and practically negligible in considering the capacity of a wheel. To show how the strains

Table 15.

Tensile and Compressive Stresses Developed Along Radial and Tangential Lines in Both Inside and Outside Plates of a 33 In. 725 Lb. M. C.B. Wheel Under Vertical Loads.

	Load—21,000 Lbs.				Loads—80,500 Lbs.				Load—150,000 Lbs.				Load—200,000 Lbs.			
	Tension		Comp.		Tension		Comp.		Tension		Comp.		Tension		Comp.	
	Tan.	Rad.	Tan.	Rad.	Tan.	Rad.	Tan.	Rad	Tan.	Rad.	Tan.	Rad.	Tan.	Rad.	Tan.	Rad.
Outside Plate Radius A	2700	....	....	2400	5000	....	....	11600	8700	....	....	16200	11900	....	....	19800
B	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
C	1000	2500	1300	....	....	3700	2200	....	1300	3600	2800	...	400	5100	5800	....
D	1800	1700	900	....	700	....	200	1300	....	2700	1500	...	....	7400	....	....
E	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
F	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
G	1400	3400	300	....	....	2700	1300	....	1600	3500	3600	1000	....	3200	3700	2700
H	....	3100	1700	800	....	....	1500	7900	....	5600	2700	9400	....	7100	2000	12000
Inside Plate Radius A	....	1400	1300	900	1200	1800	900	1500	6100	....	....	2000	9100	....	...	8000
B	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
C	1700	....	....	500	2900	....	....	2700	3200	3000	..	...	900	3700	1000	....
D	....	....	1300	....	....	...	3300	....	1000	2700	2800	2700	2600	3500	3500	3000
E	400	...	2900	1100	6100	2000	4200	900	....	....	....	....	....	....	....	....
F	....	..	....	....	1700	...	....	1500	1100	1400	....	1300	1100	1500	....	1200
G	....	400	700	....	....	800	1500	....	....	1000	2800	....	....	2100	3500	...
H	1400	....	....	1100	....	....	....	2400	1600	4800	...	....	6600	4000	....	6000

from present maximum loads to loads radically beyond the possibility of railroad service, develop tests were made of 21,000 pounds, 80,500 pounds, 150,000 pounds and 200,000 pounds and the maximum stresses under these loads are shown in Table 15.

The only item worthy of comment regarding the stresses under vertical load is that the largest stress for a 200,000 pound wheel load is below 20,000 pounds per square inch and that the stresses are not at all symmetrical through the metal. As far as wheel loads are concerned, they are of no direct importance but indirectly the load determines flange pressure, development of heat, etc.

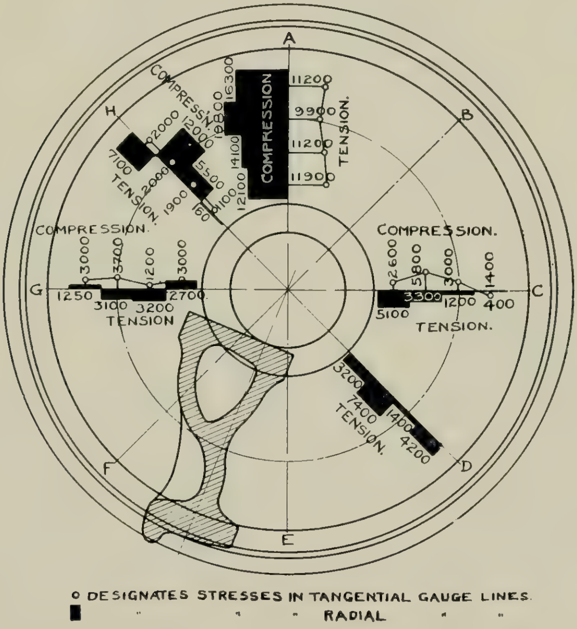


Fig. 30—Showing Location and Intensity of Compressive and Tensile Stresses Developed in the OUTSIDE Plate of a 725 lb. M. C. B. Wheel Under a Vertical Load of 200,000 Pounds.

Temperature Stresses.

The stress of the greatest magnitude within the car wheel is produced by the difference in temperature between tread and hub resulting from brake friction. This difference in tempera-

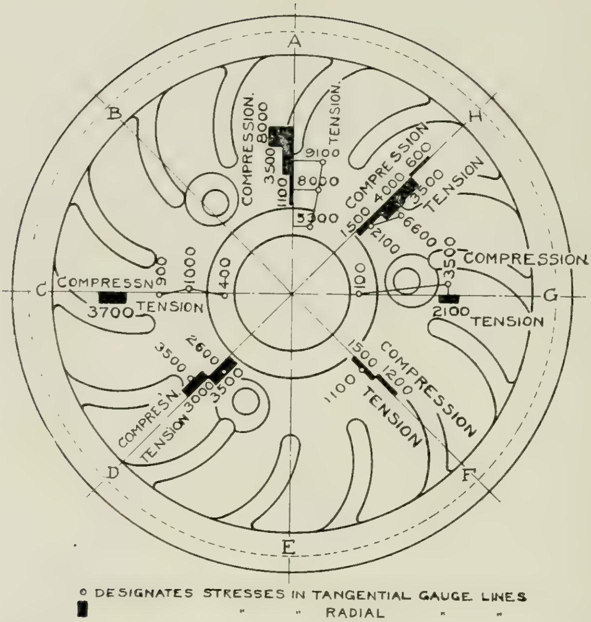


Fig. 31—Showing Location and Intensity of Compressive and Tensile Stresses Developed in the INSIDE Plate of a 725 lb. M. C. B. Wheel Under a Vertical Load of 200,000 Pounds.

ture is a direct function of the brake shoe pressure, the velocity of the wheel and length of time pressure is applied.

A study into these variable conditions is productive of much useful information regarding the limitation of wheels and methods of operating trains that will produce the maximum economy and safety. The first investigation has to do with the coefficient of friction of brake shoes at various shoe pressures and at various velocities.

The M. C. B. Association have made voluminous tests during the past 20 years to establish the coefficient of friction of brake shoes for the purpose of determining data with reference to time required to stop a car from various velocities. No information is available concerning coefficient of friction, shoe loss and the effect upon wheels of continuous application at various shoe pressures and various uniform velocities.

To determine these factors a series of tests are now being conducted at the University of Illinois which indicate that for continuous application of a pressure of 1500 pounds the coefficient of friction of a Diamond "S" brake shoe on a chilled iron wheel closely approximates the percentages indicated in Figure 32.

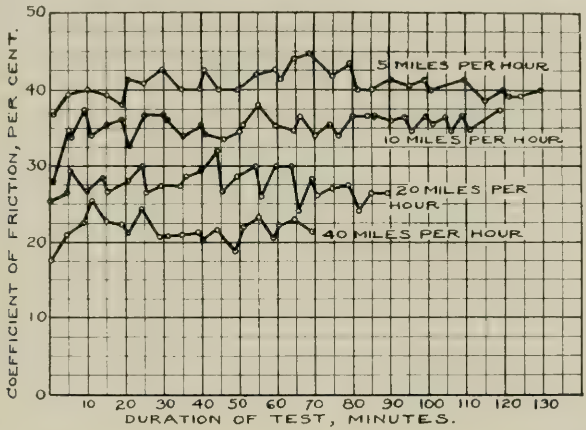


Fig. 32—Coefficients of Friction as Recorded During Tests. Diamond "S" Brake Shoe Applied to a Chilled Iron Wheel Under 1500 Lbs. Pressure at Various Speeds.

From this and other data developed at Purdue University, the approximate coefficient of friction for various velocities and pressure is shown in Table 17.

Table 17—Coefficients of Friction (Diamond "S" Brake Shoe and Chilled Iron Wheel).

Shoe Pressures—Pounds.

Speed M.P.H.	500	1000	1500	2000	3000	4000	5000	6000	7000	8000	9000	10000
5	60	50	41	33	27	24	22	20	19	18	17	16
10	50	41	33	27	24	22	20	19	18	17	16	15
20	41	33	27	24	22	20	19	18	17	16	15	14
30	33	27	24	22	20	19	18	17	16	15	14	13
40	27	24	22	20	19	18	17	16	15	14	13	12
50	24	22	20	19	18	17	16	15	14	13	12	11
60	22	20	19	18	17	16	15	14	13	12	11	10
70	20	19	18	17	16	15	14	13	12	11	10	9
80	19	18	17	16	15	14	13	12	11	10	9	8

Having determined upon the coefficient of friction for each velocity and each pressure it is an easy matter to show the shoe pressure required to offset the gravity effect on any load on any grade. Theoretically, a shoe pressure of this kind would main-

Table 16.

Shoe Pressure Required per Wheel to Maintain Uniform Speed on Various Grades.

Aver. Brak. Press.		60,000 Lbs. Cap. Cars 95,000 Lbs. Gross Load					80,000 Lbs. Cap. Cars 132,000 Lbs. Gross Load					100,000 Lbs. Cap. Cars 161,000 Lbs. Gross Load					140,000 Lbs. Cap. Cars 210,000 Lbs. Gross Load				
Per Car		20,000 Lbs.					22,000 Lbs.					24,400 Lbs.					32,000 Lbs.				
Aver. Brak. Press. Per Wheel		2,500 Lbs.					2,750 Lbs.					3,050 Lbs.					4,000 Lbs.				
Grade		1%	2%	3%	4%	5%	1%	2%	3%	4%	5%	1%	2%	3%	4%	5%	1%	2%	3%	4%	5%
Pounds Pull per Wheel due to Gravity (4% Grade Deducted)		71	190	309	428	546	99	264	429	594	759	121	322	523	724	926	157	420	682	945	1207
Speed in Miles per Hour.	5	100	300	500	800	1100	200	400	800	1300	2400	200	600	1100	2200	3800	200	800	1800	3900	6000
	10	150	400	700	1000	1600	250	600	1000	2300	3200	200	700	1500	3000	4400	300	1000	2800	4600	6600
	20	200	500	800	1600	2400	300	800	1600	2600	3600	300	900	2200	3400	4800	400	1600	3200	5000	
	30	250	600	1200	1900	2600	350	1000	1900	3000	4000	400	1300	2500	3800		500	1900	3500		
	40	300	700	1400	2200	2900	400	1100	2200	3200		500	1500	2800			600	2100			
	50	350	800	1600	2300		450	1300	2300			500	1700				700				
	60	400	900	1700			500	1400				600									
	70	450	1000				550														
	80	500																			

tain a uniform velocity. Table 16 has been prepared showing the effect of gravity for a fully loaded car of each standard capacity and the shoe pressure required to produce a tangential pull sufficient to offset this effect and the average total braking power of each capacity based on 60 percent of tare weight of the car at 50 pounds brake cylinder pressure.

If brakes could be uniformly applied at a constant pressure, there would be no difficulty whatever in handling the heaviest capacity car on any grade found in ordinary railway service. Also the heat generated in the wheel would be so small that it would not require investigation. We know by experience, however, that certain wheels become excessively hot because of irregularities in shoe pressures throughout the train and for this reason it is essential to ascertain how much abuse each weight of wheel can withstand without encroaching too far on a reasonable factor of safety. Figure 33 shows the shoe pressures at various velocities that are required to maintain a uniform speed on various grades.

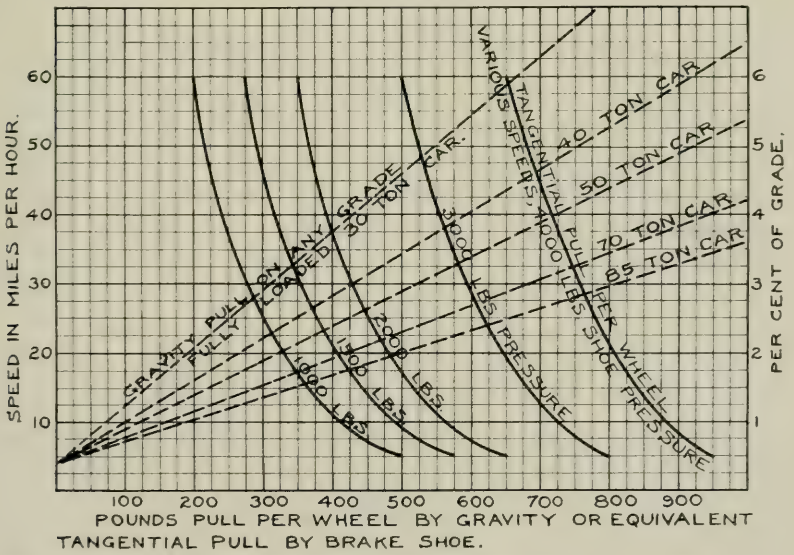


Fig. 33—Brake Shoe Pressures Required per Wheel to Overcome the Gravity Pull on Standard Fully Loaded Cars Descending Various Grades at Various Speeds.

It is well known that the cause of practically every wheel broken in service is overheating; hence the extreme importance of ascertaining what is meant by overheating and how it can be avoided. The temperature developed in a 625 pound wheel has been well established for a 1500 pound shoe pressure, which produces a retardation equal to that required to handle a fully loaded 100,000 pound capacity car on a 3 percent grade at 5 M. P. H. or the same car on a 2 percent grade at 50 M. P. H.

The tests were made by observing the temperature at a point ½-inch below the tread and also center of the plate intersection and at the hub. The tread metal, of course, heats up very much more rapidly than the metal in the plate because the conduction of heat through chilled iron is relatively slow. The differences in temperature between these two points at intervals of a few thousand revolutions are plotted, the result being shown in Figure 34.

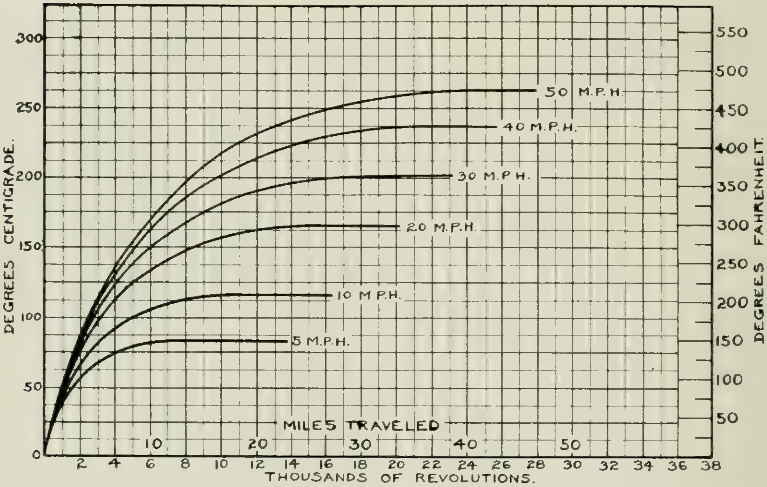


Fig. 34—Differences in Temperature Between the Tread and Plate of a 625 Lb. Wheel at Various Speeds and Distances of Travel Resulting From a Brake Shoe Pressure of 1500 Lbs. per Wheel.

The difference in temperature for doing the same amount of work is very much greater in the higher speeds than in the lower speeds. After a run of 20 miles at 5 miles per hour, a constant difference of 150° of heat in temperature between tread and intersection was maintained because the amount of radiation became equal to the input, whereas at 50 M. P. H. the difference in temperature was 420°, a constant difference was reached after about 35 miles of travel.

In addition to determining the temperature difference, the deformation of the metal in the face and back of the wheel at various intervals was determined with a Berry strain gauge, and by referring to these readings after making correction for expansion due to temperature changes, to the chart showing the relation of strain to stress a law is established showing the relation of difference in temperature to stress per square inch.

Chilled iron has a great advantage over steel with reference to temperature stresses from the fact that while the coefficient of expansion is the same in each case, the modulus of elasticity of chilled iron at the higher ranges is about one-third as much as that of steel. It, therefore, follows that the temperature stresses in the steel wheel for the same difference in temperature between the tread and plate must be materially greater than in chilled iron.

Preliminary work of this character was first attempted at Purdue University for the A. M. C. C. W. in the year 1913. The work now being done at the University of Illinois is for the purpose of continuing the work started at Purdue and it is intended to determine the various characteristics of each of the M. C. B. standard designs and also special designs to establish the factor of stress divided by temperature for each pattern. This is a very essential criterion to be used in connection with the standardization of wheels.

The indications at Purdue were that this factor varied widely according to the design, and it is the purpose to now continue the test to a point that will definitely determine whether it will be desirable to radically modify the design of M. C. B. wheels in such a way that the stress in the plate of the wheel may be materially reduced for any temperature difference as compared with the present standard. Several of these factors have been assembled in Figure 35.

First, the temperature differences for various speeds under a shoe pressure of 1500 pounds are shown. These have already been explained in Figure 34.

Second, the millions of foot pounds of retardation corresponding to these pressures and velocities is shown in such a

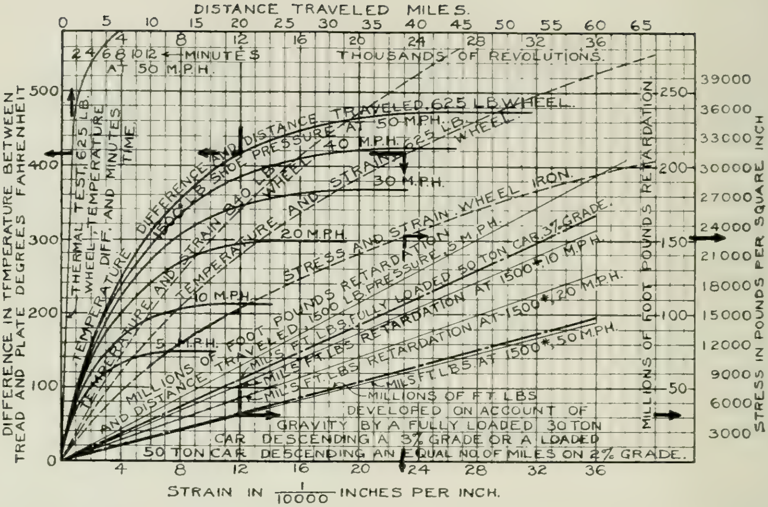


Fig. 35—An Assembly of Curves and Lines to Show in One Chart the Relation of the Several Factors Contributing to the Stress in the Plate of a 625 Lb. Wheel to Which a Shoe Pressure of 1500 Lbs. is Applied. Other Features Are Explained in the Text.

way that the amount of retardation is known for any point in the temperature difference curve. In other words, the retardation between work done and temperature difference in the wheel is established.

Third, two curves are shown indicating the maximum deformation in the plate of the wheel for temperature difference, one for the 625 pound wheel and one for the 840 pound wheel.

Fourth, the relation to strain of metal as indicated by the number of ten thousandths inches elongation per inch for various stresses is shown. By the use of this curve the stress per square inch in the metal of the plate of the wheel is determined for any temperature difference.

Fifth, a curve showing the rise of temperature on a 625 pound wheel during a thermal test. The time is scaled to correspond with a speed of 50 M. P. H., thus giving a direct comparison with a shoe pressure of 1500 pounds at that speed. The table can be used as follows:

For example—A shoe pressure of 1500 pounds is applied continuously to a 625 pound wheel under a 30 ton car traveling at the rate of 50 M. P. H. for a distance of 20 miles on a 3 per-cent grade.

1. How many million foot pounds of retardation have been developed?
2. What will be the difference in temperature between the tread and plate of the wheel?
3. What will be the maximum deformation at a point near the intersection of the plates?
4. What will this deformation represent in pounds of stress per square inch?

Entering the table on the vertical line representing 20 miles of travel we find the intersection with the line showing retardation at 50 M. P. H. which corresponds with the line showing the gravity effect of a fully loaded 30 ton car on a 3 per cent grade. By referring this point to the scale of millions of foot pounds of retardation we find that the wheel has absorbed 30 million foot pounds of energy. Following the vertical line from the intersection until it crosses the temperature curve for 50 M. P. H. we find that the temperature at the left hand margin is about 410°. Following this horizontal line until it intersects the strain and temperature curve for the 625 pound wheel and referring to the scale at the bottom it is noted that the strain is represented by .0023 inches. Following the vertical line downward to the intersection with the stress and strain curve we find at the right hand margin on the horizontal line with this intersection the stress per square inch is shown to be 23,000 pounds. It will be noted that the same temperature difference in an 840 pound wheel will produce a stress of 19,000 pounds per square inch.

By referring to the temperature curve for thermal test, it will be seen that at the end of two minutes, which is the specified duration of the M. C. B. test, the temperature difference is 490° which corresponds to the temperature difference in the 625 pound wheel after traveling 40 miles at a speed of 50 M. P. H. with a pressure of 1,500 pounds continuously applied. It is further observed that this temperature difference on the temperature strain curve for a 625 pound wheel corresponds with a deformation of .0031 inch per inch, which on the stress and strain curve corresponds with 28,000 pounds stress per square inch. At the end of six minutes the temperature difference has passed outside the limits of the chart but represents a stress per square inch of 30,000 pounds.

The results so far obtained represent but a fair start at the ultimate problem, for it will be necessary to prepare temperature difference curves and temperature difference strain curves for each design of wheel before much light will be thrown upon th relative values of wheels of different weights of the same general design and the possibility of designing in such a way that there may be a high temperature difference for a small deformation in the plate of a wheel.

It is fortunate that the temperature stresses in tension along radial lines while the tensions from pressing on are compressive in the same direction and therefore are in opposite directions and tend to neutralize each other. It is also worthy of note that the stresses arising from pressing on and from temperature differences are very unsymmetrical with reference to the section of the wheel. This indicates that it is possible to place the metal in such a way that the stresses will pass through the section more centrally which removes the lever arm of the force and eliminates the bending moment, thereby reducing the tendency to bend or warp th wheel which will materially reduce the stress per square inch of section.

The manner in which trains are operated on descending grades has a decided bearing on temperature stresses within wheel. This is seen at a glance in Figure 34 which shows temperature differences for various velocities of operation.

The tremendous advantage in train control through the use of low speeds and low shoe pressures is strikingly demonstrated. For example, the 100,000 pound car is equipped with a 10-inch brake cylinder having a piston area of 78.5 square inches, which at 50 pounds pressure delivers 3,900 pounds to the cylinder lever. The braking power of the average 100,000 pound capacity freight car is 24,300 pounds. Therefore, the brake leverage in these cars is 1 to 6.3. A 10 pound reduction gives a 22 pound cylinder pressure when the piston travel is 8 inches, which develops a 1,360 pound shoe pressure on each wheel. This requires a coefficient of friction of 23.7 percent to equalize the grade effect of a fully loaded 100,000 pound capacity car on a 2 per cent grade which is 322 pounds per wheel.

Referring to Table 17 it is seen that this coefficient of friction is developed at 30 M. P. H. which constitutes the limit of uniform speed for this shoe pressure, but if the speed is reduced to 5 M. P. H. the coefficient of friction increases to 41 per cent, giving 73 per cent more retardation that required. This shows the ease with which trains can be controlled at slow velocities and how easy it is to have runaways on 3 or 4 per cent grades where velocities are not closely checked. The economy in brake shoes is also very great at low velocities as compared with higher velocities—See Figure 36.

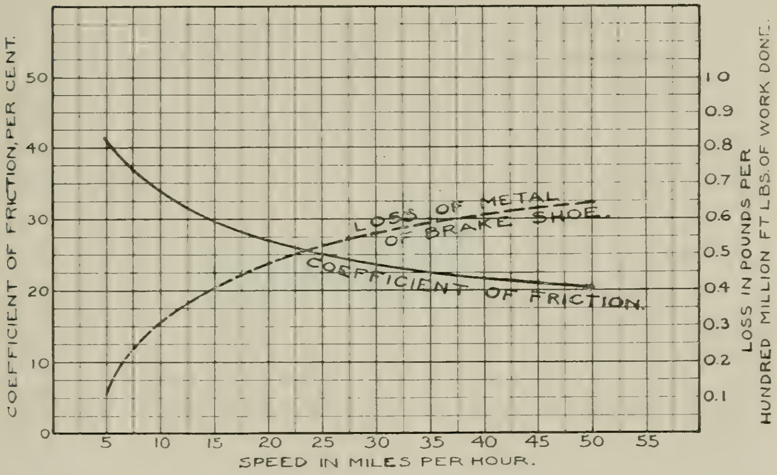


Fig. 36—This Shows the Approximate Results of a Diamond "S" Brake Shoe Applied to a Chilled Iron Wheel Under a Pressure of 1500 Lbs.

On grades of 2 per cent or over, 75 to 90 per cent of the retainers should be set to hold 20 to 30 pounds cylinder pressure and the first application of brakes should be made as soon after passing the summit as practicable without bringing the train to a stop. The velocity for the first two miles should be exceptionally low which allows the wheels to heat gradually while a large percentage of the heat is lost by radiation.

Figures 35 and 36 show the following advantages for low velocities, the shoe pressure being 1,500 pounds.

	5 M. P. H. 4 Hours	50 M. P. H. 24 Min.
Coefficient of friction	41%	20%
Million foot pounds retardation 20 miles	64	32
Temperature difference between tread and plate intersection	150°	420°
Maximum stress in plate in lbs. per square inch	9,000	23,000
Loss of brake shoe metal per 100 million foot pounds of work done	.10 lbs.	.65 lbs.

This comparison refers to a 625 pound wheel with retardation more than sufficient to handle a 50 ton loaded car on a 2 per cent grade at ordinary velocities. Notwithstanding that at 5 M. P. H. the retardation was twice as great as at 50 M. P. H. the stress per square inch developed in the plate of the wheel was only 40 per cent as great.

If the shoe pressures were uniform throughout the train there would be very little concern regarding the temperature stresses in the wheel, brake burns, shell outs, slid flats or other defect originating in irregularities in braking power. Unfortunately, however, there are gross variations in the percentage of braking power based on the light weight of the car and 160 per cent variation in the light weight of cars of the same capacity and 200 per cent variation due to irregularities in piston travel, irregularities arising from angularities of the brake hanger, variation in the coefficient of friction, brake shoes and type of wheel used. A combination of these irregularities may very easily increase the braking power 300 per cent above normal in certain cars while in others the braking power become negligible. For this reason it is necessary to standardize wheels for 300 per cent above the normal requirements for temperature stresses.

When operating trains on long descending grades it is well to have a thermal station at which stops of 10 minutes are made at from 5 to 7 miles below the summit. The effect of such a station is shown in Figure 37. The temperature of the tread of the wheel will drop 150° in 10 minutes while the temperature at the intersection of the wheel is actually increased. There is little danger of overheating the hottest wheels if proper attention is given to keeping the air brakes in uniform adjustment and in operating trains as above outlined.

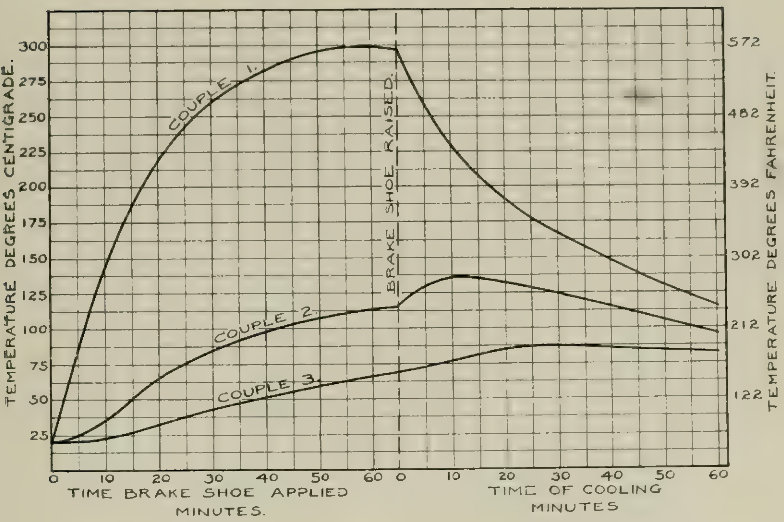


Fig. 37—Chart Showing Rise in Temperature of a 625 Lb. Wheel Under a Shoe Pressure of 1500 Lbs. at 30 M. P. H. and Fall in Temperature After Release of Brake Shoe.

Stresses Developed in Pressing the Wheel on the Axle.

It is self-evident that the stresses originating from pressing a wheel on the axle are in compression along radial lines from the hub to the tread, and in tension along tangential lies. In other words, the metal is crowded together from hub to tread with a tendency to split or pull apart with the fracture along radial lines. That the stresses are high is common knowledge because occasional wheels burst in the press, but very little or no attempt has been made to ascertain definitely just how great these stresses are.

If the machine work in connection with turning the axle and boring the wheel is uniform, the stresses in the wheel will be symmetrical and well within the factor of safety, but irregularity in boring the wheels such as occurs where the finished bore is produced with one cut, and the axle wheel seat is irregular, elliptical or tapered, the stresses in the wheel may become bunched and may destroy the wheel.

The University of Illinois tests are expected to throw some light on the result of irregular work as well as to establish the best practice. The results obtained from a single pair of 725 pound wheels pressed on at 123,000 pounds is shown in Figure 38.

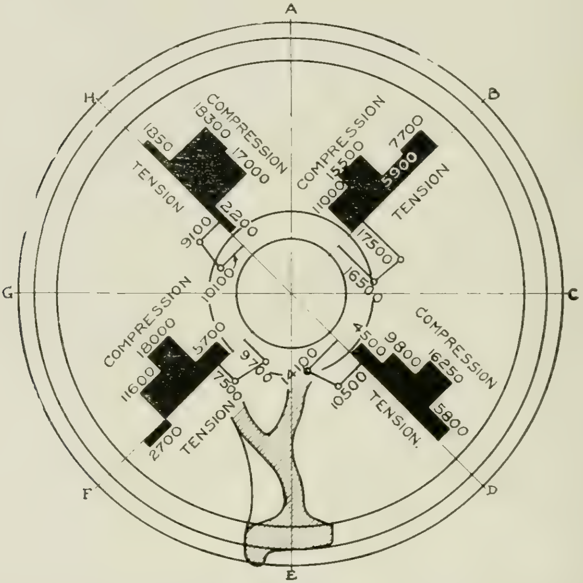


Fig. 38—Showing Location and Intensity of Compressive and Tensile Stresses Developed in the Outside Plate of a 725 Lb. M. C. B. Wheel From an Axle Pressure of 123,000 Lbs

The stresses were fairly uniform, varying from 15,500 to 18,000 pounds in compression in the front plate, and considerably less in the back plate. The tensile stresses range as high as 17,400 pounds in the back hub and slightly less in the front hub. As more tests are completed with varying grades of machine work, information of real value will be obtained which will be helpful in eliminating rough and irregular machine work which is now sometimes the cause of broken wheels and broken axles as indicated by the government investigations.

The relation of mounting pressure to diameter of axles and distance through hub is shown in Figure 39. Our experience with the larger axles is very recent, but we know that the limits given are safe in practice.

As far as design goes, the metal should be placed in such a way that the stresses from pressing on decrease uniformly from the hub toward the rim, eliminating certain large increments of stress in very short distances because of sudden variations in the section of metal through which the stress is being transmitted.

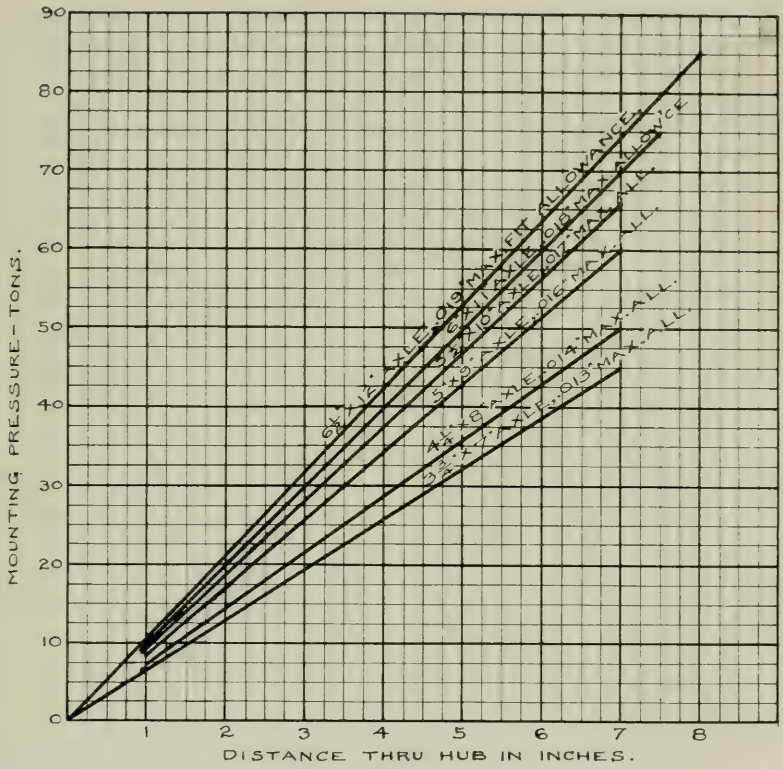


Fig. 39—Chart Showing Rise in Mounting Pressure as the Wheel is Forced on the Axle.

Heat Defects.

In the foregoing discussion in a search for the limiting load for the chilled iron wheel we have been unable to discover any item within the wheel indicating an approximation to any condition which would limit the chilled iron wheel. There are several conditions, however, which arise largely through a decidedly unequal distribution of work, which destroy the integrity of the wearing metal on the tread, causing the removal of the wheel before it has given the full measure of service.

Certain cars are called upon to do from 100 to 300 per cent more work in retardation than other cars of the same capacity, and inasmuch as this excessive retardation is transforming mechanical energy into heat the final result must show itself on the tread of the wheel.

Figure 40 shows the special character of the blemish which is developed from excessive heat between the brake shoe and wheel or between the wheel and rail, when the wheel is skidding.

In the case of wheel A, Figure 40, the defect was caused by excessive brake friction extending entirely around the circumference of the wheel. The defect in wheel B is largely from the same cause, although not as fully developed. In the case of wheel A, the brake shoe had a bearing near the rim, whereas

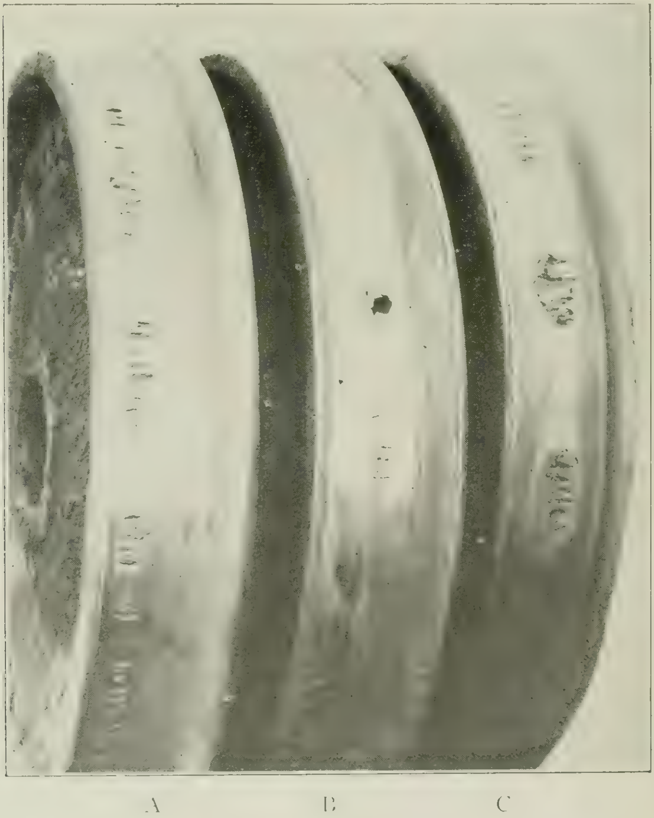


Fig. 40—Excessive Brake Burning and Comby Tread.

in B, the brake shoe had a tendency to run as closely to the throat of the wheel as possible. Wheel C represents a series of skidded spots, producing short flat spots and showing that the metal was so intensely heated that thermal cracks appeared and through subsequent pounding the metal has disintegrated.

Conditions of these kinds occur in bringing a train to a stop. because the greatest frictional resistance between wheel and brake shoe occurs just before the wheel ceases to revolve, and often at this point frictional resistance exists between wheel and rail, in which case the wheel begins to slide. After the wheel once begins to slide, frictional resistance is very much lessened and sliding will be continued until the brake pressure is reduced. In sliding over a distance of only a few feet before the cars come to rest, the term "skidding" is applied, and a flat or skidded spot, the size of the area of contract between wheel and rail is produced. The following diagram shows actual size and shape of these contact areas under various loads as determined by the American Society of Civil Engineers in a test with new 33-inch chilled iron wheels on a 75 pound rail having a top radius of 14 inches.

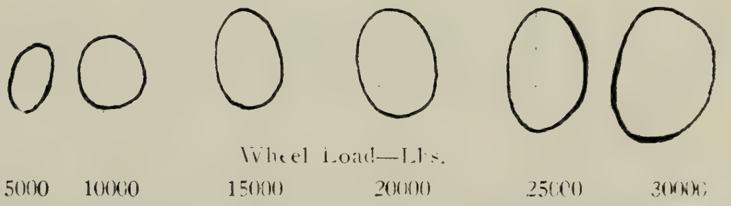
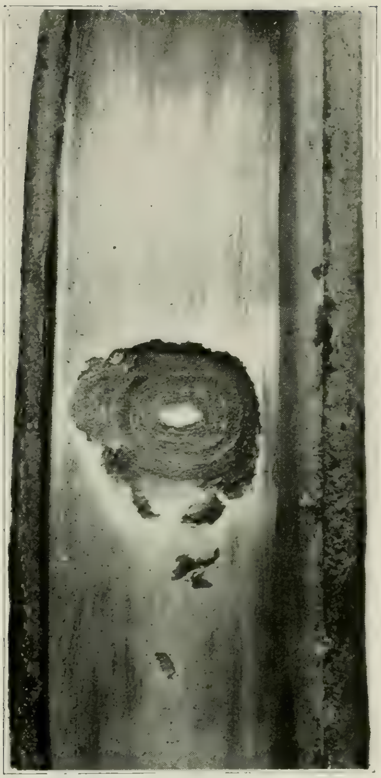


Fig. 41—Contact Areas Between a 33 In. Chilled Iron Wheel and a 75 Lbs. 14 In. Top Radius Rail. (Full Scale).

A flat spot no larger than these contact areas is not sufficient to cause the removal of the wheel, but the subsequent pressure and blows received in regular service very often results in the metal shelling out around the center of this contact area, forming a shelled spot as shown in Figure 42.

During the time the wheel is sliding all mechanical energy represented in the resistance to motion is transferred to heat through the agency of friction. The exact amount of heat produced by skidding can be calculated.



Fg. 42—Typical Form of Shelled Out Spot.

For fully loaded cars the heat developed in skidding 10 feet is sufficient to melt the following amounts of iron per wheel:

30 ton car	.59 lbs.
40 ton car	82 lbs
50 ton car	1.01 lbs.
70 ton car	1.31 lbs.
85 ton car	1.56 lbs.

This heat is developed in the course of a very few seconds and the amount of metal through which it must pass to the wheel is the mere fraction of an ounce, and being concentrated on one spot the melting point is reached almost instantaneously. The small contact area is subject to a violent expansion which can occur in only one direction, and that is outward from the wheel.

Figure 43 shows a cross section of a shelled spot. That portion between A and C during the process of skidding is of extremely high temperature, practically at the melting point, and expansion is restricted by the shoulders A and C of cold metal, and as the hottest portion of the metal is at the center B, it expands upward, allowing the concentric rings of metal to expand toward the center, causing a cleavage plane along the line B—D. After the skidding ceases, the metal is very quickly cooled, which causes thermal cracks to be introduced in concentric rings and the subsequent pounding on the rail disintegrates the metal which, after falling out, produces the condition shown in Figure 42.

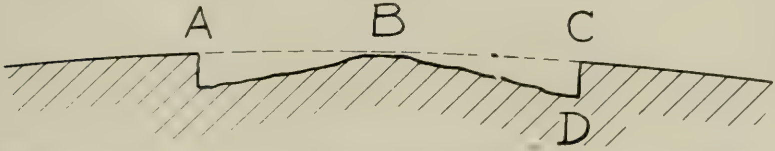


Fig. 43—Cross Section of a Shelled Spot Showing the Raised Center.

Where the wheel slides for a greater distance, the melting point is reached and a segment of the metal is rapidly rubbed away which quickly increases the area of contact, giving a much larger surface to receive the heat, thereby reducing the temperature. In this case the heat is sufficient to cause disintegration of the metal from a net work of fine thermal cracks which, as in the case of the shell out, disintegrates and drops from the surface of the tread of the wheel in subsequent service, leaving a rough jagged appearance as shown in Figure 40—C.

This defect is commonly termed "comby from slid burned." If the sliding had continued over a much longer distance a typical flat spot would have resulted, which would call for the removal of the wheel as soon as it reached a repair track. It was formerly the custom to call these defects "sand holes" or "slag in the metal", indicating an initial defect in the wheel. This idea, however, is not consistent with observations in practice, where it is usual to find such defects in both wheels of a pair and in the same plane, indicating that the defect arose from slippage on the rail. The tendency of wheels to shell in pairs or in several pairs under the same car is well illustrated in an analysis of results obtained from 500 refrigerator cars, representing a total of 4,000 wheels. Of this number, 189 were removed for shelling out, and the relation of this defect to the mate wheel is shown in the following summary:

174 shells in pairs.

15 shells singly.

Under 8 cars every wheel was shelled.

Under 4 cars 4 wheels were shelled.

This indicates not only that shelling is due to intense local heating while skidding on the rail, but it is also a matter of observation that this defect occurs under equipment having the highest braking power and making most frequent stops, such as engine tender, heavy passenger and interurban cars; and in freight service it is much more common in the cars of heavy tare weight which, in some cases, have a braking power 10 per cent above the M. C. B. standard.

In a recent report of the National Association of Railway Commissioners, in discussing the relation of heat generated by the brake shoe to the tread of the wheel, the following statement is made:

> "So severe are thermal effects of this kind that no grade of steel will resist them, hence the appearance of thermal cracks is not to be taken as an indication that the steel has been lacking in good qualities. Under the influence of heat all metals succumb."

These thermal effects are largely produced by irregularities in present standards, irregularities in application of the standard, irregularities in brake pressures on long grades, irregularities in brake hangers and irregularities in piston travel. A concerted action by this Club could accomplish much in correcting these irregularities, the cost of which would be trivial.

The various items should be given publicity and each use his influence within his own sphere of action. These are all items which come under the head of the Safety First program, and a little amount of effort in removing accident hazards would yield a large return to the individual railroad companies.

Wheel Standards.

In preparing standards for the entire railway equipment the first information required is a classified list of the equipment to be served. This has been secured and is shown in Table 18.

Table 18.

	Tare Weight	Braking Power			
		Total	Per Cent		Per Cent Cars Represented.
			Tare Weight	Gross Load	
Axles 4¼x8 Journals—95,000 Lbs. Gross Load.					
60,000 LBS. CAPACITY.					
860,000 Freight Cars					
Light Cars	22.000 lbs.	13,200 lbs.	60	13.9	4.
Average Cars	32,000 lbs.	19.200 lbs.	60	20.2	100.
Heavy Cars	52,000 lbs.	31,200 lbs.	60	32.9	1.
Engine Tenders.					
5000 Gals. Tank Capacity	35,000 lbs.	31,500 lbs.	90	33.2	..
Axles 5x9 Journals—132,000 Lbs. Gross Load.					
80,000 LBS. CAPACITY.					
800,000 Freight Cars.					
Light Cars	27,000 lbs.	16,200 lbs.	60	12.3	4.
Average Cars	37.000 lbs.	22,200 lbs.	60	16.8	100.
Heavy Cars	50.000 lbs.	30,000 lbs.	60	22.7	1.
Engine Tenders.					
7,000 Gals. Tank Capacity	49,000 lbs.	44,100 lbs.	90	33.4	..
Axles 5½x10 Journals—161,000 Lbs. Gross Load.					
100,000 LBS. CAPACITY.					
700,000 Freight Cars.					
Light Cars	32,000 lbs.	19,200 lbs.	60	11.9	7.
Average Cars	41,000 lbs.	24,600 lbs.	60	15.3	100.
Heavy Cars	50,000 lbs.	30,000 lbs.	60	18.6	1.
Engine Tenders.					
9,000 Gals. Tank Capacity	63.000 lbs.	56.700 lbs.	90	35.2	..
Axles 6x11 Journals—210,000 Lbs. Gross Load.					
140,000 LBS. CAPACITY.					
10,000 Freight Cars.					
Average Cars	53,000 lbs.	31,800 lbs.	60	15.1	100.
Engine Tenders.					
12.000 Gals. Tank Capacity	75,000 lbs.	67,500 lbs.	90	32.2	..
Axles 6½x12 Journals—250.000 Lbs. Gross Load.					
170,000 LBS. CAPACITY.					
Average Cars	62,000 lbs.	37,200 lbs.	60	14.9	100.
Engine Tenders					
14,000 Gals. Water	80.000 lbs.	72.000 lbs.	90	28.8	..
20 Tons Coal.					

After securing list of equipment it is necessary to go over each capacity and note the stresses that are possible for maximum conditions that are likely to arise in that class.

The only standards recommended by the Master Car Builders Association are 625 pound wheel for cars of maximum gross weight not to exceed 95,000 pounds, the 675 pound wheel for cars of maximum gross weight not to exceed 132,000 pounds and the 725 pound wheel for cars of maximum gross weight not to exceed 161,000 pounds.

These standard were developed for gondola freight service without reference to temperature stresses except in so far as may be indicated by variations in gross load. These standards, however, are extended to passenger service and to engine tender service where the heat stresses are out of all proportion to the gross load when this various equipment is operated in one train. Starting out with the proposition that the heaviest stresses developed in the wheel are temperature stresses which originate from brake friction and that the heating of the wheel is proportional to the braking power it follows directly that wheel which may be entirely satisfactory under freight equipment in which the braking power is 15 per cent of the gross load are not at all suited for passenger service having braking power equal to 75 per cent of the gross load, or for engine tender service with braking power of 33 per cent of the gross load.

The American Railway Master Mechanics Association has never in its recommended practice considered any standard for engine tender wheels differing from those of the Master Car Builders' designs for equivalent wheel loads. How this works out in practice is shown in Table 19.

Table 19.

	M. C. B. Standards				Engine Tender Requirements		
Size of Journal.	Weight of Wheel Lbs.	Gross Load Lbs.	Braking Power Lbs.	Per Cent. Gross Load	Braking Power for Equivalent Gross Load	Per Cent. Gross Load	Excess Braking Power Over M.C.B. Std.
4¼ x 8	625	95,000	19,200	20.2	31,500	33.2	65%
5 x 9	675	132,000	22,200	16.8	44,100	33.4	100%
5½x10	725	161,000	24,600	15.3	56,700	35.2	130%
6 x11	850	*210,000	31,800	16.1	67,500	32.2	112%
6½x12	950	*250,000	37,200	14.9	72,000	28.8	93%

* Recommended by the Association of Manufacturers of Chilled Car Wheels for Freight Equipment.

The point to be observed is that on divisions having long grades that practically twice as much heat is developed in engine tender wheels as in freight wheels carrying an equivalent load in the same train. Hence there is no justification whatever for using the M. C. B. standards for engine tenders.

Without waiting for final conclusions of all temperature tests there is a large mass of classified data that is definite and points with unerring directness to the standards that should be immediately used and the fact that some later data will modify in a slight degree some of these designs in no way relieves the responsibility of using the proper factor of safety at the present time. Table 20 shows the present standards used for both freight and engine tenders indiscriminately, also the proposed independent standards for heavy freight and engine tender service. These weights contemplate the reinforced flanges and heavy rims.

Table 20.

Size of Journal Inches	Present Standard Freight Engine Tender and Pass. Service Lbs.	Proposed Standard for Heavy Service	
		Freight Lbs.	Eng. Tdr.&Pass. Lbs.
4¼ x 8	625	675	725
5 x 9	675	725	775
5½ x 10	725	775	825
6 x 11	...	875	950

CONCLUSIONS

In the foregoing survey of the mechanics of Car Wheels to ascertain the limiting feature in the wheel which will first succumb to an overload, the following irresistible conclusion have been established:

Bearing Power

The bearing power is practically proportioned to the load but the capacity of the wheel in this respect is so much greater than that of the rail that the limiting loads from a standpoint of bearing will always be determined by the rail.

Vertical Load

Stresses originating in the wheel from the vertical load are small in comparison with other stresses and require only secondary consideration.

Temperature Stresses

The possibility of repeated heating of the tread must be carefully considered: First, from the standpoint of the gross load and the grade over which the car may operate, and, second, from the standpoint of the braking power of the car as compared with the average braking power of cars of corresponding or heavier capacities. While stresses of the greatest intensity arise from continued brake heating, any desired factor of safety can be secured by simply proportioning the metal in the plate to correspond with the stress. Hence, there is no limitation to the reliability of the wheel from the standpoint of temperature stresses.

Flange Pressure

Stresses in the flange are proportional to the load. The section of the flange can be made of any strength required.

Stress in the Plate Developed by Flange Pressure

This item has not yet been determined but evidently the stresses are not large in comparison with others and, therefore, of secondary importance.

Stresses from Pressing on the Axle

The laws of pressure fits and the stresses in the metal in the hub surrounding the axle are now well established and it is only necessary that sufficient metal be used in the hub and plate to maintain the stresses within proper working limits.

Local Heating of Tread

Under certain conditions of unequal distribution of braking power, the surface of the tread may be heated to the melting point, resulting in a series of blemishes known as "shelled" and "comby", which may be of sufficient seriousness to cause the removal of the wheel.

It is thus seen that in no part of the wheel is there any indication of the impossibility of designing the wheel strictly in proportion to the stresses developed, with the possible exception of local heating of the tread.

If there is any one thing that has been absolutely demonstrated it is that the chilled iron wheel can be designed to meet any operating condition now existing or likely to exist on any railroad. It has been conclusively shown that the heaviest stresses that can occur under loads of 25,000 to 30,000 pounds per wheel can be taken care of with absolute reliability on the heaviest grades in service. Also that under these conditions, structural failures are developed in wheels made of other materials in even greater proportion than they are in the chilled iron wheel.

DISCUSSION.

PRESIDENT: The question is now open for general discussion. Do any of the members wish to discuss it? Mr. Trist, may we hear from you?

MR. N. B. TRIST, Representative Carnegie Steel Co.: "I am very glad to have been here. Altogether the paper was an excellent one and I want to congratulate Messrs. Lyndon and Vial for the thoroughness in which they have handled the subject.

"In regard to mileage performance of wheels, I would like to say that under present tests that we are now running with the steel wheel in 50-ton freight coal car service, we have now shown an average mileage of 150,000 for the first run before turning the tire, and I think that will be exceeded slightly, but not very much. The highest mileage that we have obtained so far for the first run is about 242,000 miles. I do not have any figures for the second run of the steel wheel in this service that I would care to give out at this time; probably 20 wheels have shown over 90,000 miles. Comparing some cast iron nickel alloy wheels in this service, which made about 90,000 miles as the highest and an average around 50,000 miles for their life with the first run of the steel wheel, would mean about 3 to 1."

MR. W. J. MEYER: I would like to ask a question. Is there not more possibility of a cast iron wheel becoming eccentric than a steel wheel?

MR. F. K. VIAL: My remarks on eccentric wheels are based entirely on government reports of a large number of rail breakages several years ago, I think in 1912. In nearly every case where a long string of rails were broken by a single train it was invariably an eccentric steel wheel that did the damage. I think you will find there is greater opportunity for a steel wheel in cold weather to have a greater eccentricity than can occur in chilled iron wheels. It is possible that the chilled iron wheel may not be exactly round to start with but the amount of eccentricity is certainly very small and when we once get to the point of grinding the wheel, all the eccentricity can be removed and the metal does not subsequently flow or change its shape in any way. I think we will find it to be true that there is a great deal larger opportunity of eccentricity developing in service with a rolled steel wheel than with a chilled iron wheel.

In regard to the mileages, I have often heard of 150,000 miles for the first run of a steel wheel under 100,000 to 200,000 pounds capacity cars. That of course would not occur in regular service because the wheels have not been in service long enough to develop that mileage. The average car runs from 8,000 to 10,000 miles a year. Some as high as 15,000. Our very best information as to comparative mileage comes from engine tenders where we get through with tests in a year or so. I have followed a large number of such tests to get at a comparative value, avoiding individual cases. A fair average, as nearly as I can get at it, for the first run from steel wheels is about 26,000 miles on an engine tender of 8,000 gallon capacity in ordinary service. That comes from steel tired wheels, rolled steel of all makes, and from quite a number of different railroads. On one occasion I have had an opportunity to follow the steel wheel under 100,000 capacity cars but that was on a very limited scale. In one case of 1000 cars equipped with steel wheels going into service two years ago I noticed some 200 pairs already out in front of the shop ready for re-turning, and the time is so short that they could not have rolled up a very heavy mileage. We guarantee a minimum service of four years for individual wheels under this equipment and therefore had these wheels been of chilled iron they would all have been replaced free to the railroad company. Replacements on such a scale would soon put the manufacturers of chilled iron wheels out of business. On the other hand our replacements on the four year basis are negligible. Time will tell the relative wearing qualities and wearing values of the two metals, of course, and we will ultimately have a basis for determining relative values and costs as between chilled iron and steel, but I think the 150,000 and 200,000 miles run are extremely rare under equipment having wheel loads above eight tons, as far as I have been able to observe.

I will agree that individual mileages can be run very high. We obtain 100,000 miles from certain individual chilled iron wheels under 100,000 pounds capacity cars.

MR. TRIST: In regard to the wheel mileages given, I would respectfully refer you to Mr. John H. Martin, Superintendent Car Equipment, Berwind-White Coal Mining Company for verification of figures. These cars have made about 2000 miles monthly and from 1909, when the twenty pairs of test wheels were put in service, to 1912 or 1914, some of the cars had made as high as 4000 miles in a month.

It is not a difficult problem to calculate the ton miles a wheel has carried when we know that for 50 per cent of the mileage made, the cars were loaded to capacity. The average mileage of the steel wheel in 7000 gallon tender service is 125,000 to 150,000 miles and in 8,000 gallon tender service 110,000 to 120,000 miles. On the 12,000 gallon tender service, which is the heaviest, I have no data to offer.

MR. A. E. ANDERSON, President, Pittsburgh District R. R. Co.: I would like to ask Mr. Vial if there is any increase in momentum on the larger tonnage and cars beyond the uniform proportion. For instance with your 300,000 ton mile load you have it divided up into a regular proportion each of 20,000. It would seem to me as a mechanical proposition that your larger load would make a heavier blow upon the rail and upon the tread by reason of the momentum wherever you strike the inequalities of the track.

MR. VIAL: There is a little greater increase in wear as the tonnage goes up, but it is so slight in chilled iron that I am unable to determine it. We are now using the tonnage programme as a basis for guaranty to all roads. It may not be exactly correct but it is quite close I think to actual performance. I do not pretend that the ton mileage curve is a straight line, but it is very close to it for chilled iron but probably is not true of steel.

MR. J. C. WARNE, Superintendent, Pennsylvania Casting & Machine Co.: Mr. President, I did not intend to say anything, but it seems up to me to make a few remarks.

I am rather sorry to note that the trend of the discussion is the question of mileage between the solid steel wheel and the chilled cast iron wheel. Both types have their sphere of usefulness.

For nearly thirty years, I have been connected with the chilled cast iron wheel business. Referring to mileage, several years ago when in the employ of the New York Car Wheel Works of Buffalo, N. Y., I made a drawing of a 33-inch chilled car wheel which had been removed from a Michigan Central locomotive tender after a record of 112,000 miles as certified by the Master Mechanic of the M. C. R. Railroad Shop, showing a wear of tread of $\frac{3}{16}$ of an inch. The New York Car Wheel Works also advertised in the Trade Journals of that period. They had produced 600,000 chilled car wheels without one collapsing under a car.

I well remember the wheels made by us for the first steel cars for the Bessemer Railroad. The cars were 80,000 pounds capacity, weight of wheel, 650 to 665 pounds. A large delegation of railroad officials were invited to see the tests of wheels. Some wheels were subjected to the European drop test which is different to ours, the wheel being placed in a vertical position, the same as when running under a car, not horizontally as it is in M. C. B. drop test. A weight one gross ton (2,240 pounds) is lifted to the height of one meter, then two meters, and then three meters and so on until the requirements are fulfilled. We had a very successful series of tests. I may add the wheels under the Bessemer Railroad steel cars gave excellent results. I dismounted some of these wheels after ten years of service.

Some years ago, the merits of the steel and chilled cast iron wheel were freely discussed in this Club. At that time, I made this remark that the bulk of the freight car business would in the future, as it had in the past, be carried on the chilled cast iron wheel. I think Mr. Lyndon has substantiated that remark in his paper read tonight and the chilled cast iron wheel has not by any means gone "like a dead horse floating by," as was facetiously remarked by a gentleman who took part in that discussion. Why, do you know, the greatest "black eye" ever given the chilled cast iron car wheel was by a certain railroad. It is not necessary for me to mention names.

In the early days of fifty ton cars, the company I worked for at that time secured an order for this particular railroad for wheels for their fifty ton cars. On receiving the blueprints and specifications, we were held to a minimum weight of 590 pounds and a maximum weight of 630 pounds. As a consequence, lots of our wheels failed in service. I was sent to make an examination of the failed wheels. I need hardly tell you that all the other wheel makers who had supplied wheels to these specifications had their quota of failures too. I saw them. After the inspection was over, I said to the Chief Inspector, "The day will come when your engineering staff will have to specify a 700 pound wheel for fifty ton cars." That was seventeen years ago. It came to pass, just as I had predicted. In a few months, the weight of the wheel of fifty ton cars was raised to 650 pounds, then to 675, then after intervals of time, to 700, to 725, the present M. C. B. standard and now some roads to 750 pounds. Suppose today, a foreman in a shop went to the Master Car Builder and told him he had taken a pair of 625 pound wheels and had mounted them on an axle 5½ x 10 inches for fifty ton cars and had sent them out on the road. You can imagine the rest, and yet this is exactly what was done by the railroad I have referred to.

Sometime after this, I had this experience with another railroad. An order was placed with us for wheels for 5-inch x 9-inch axles, 80,000 capacity cars. The specifications called for 600 pound wheel. The matter was referred to me. I immediately demurred. I was sent to interview the Chief Engineer about it. He wanted the 600 pound wheel, his argument being that we had previously supplied very satisfactory wheels at that weight and he objected to any over weight. In the course of our debate, I told him that 600 pounds was the recognized standard weight at that time for 4¼-inch x 8-inch axles. You would not think of putting a 4¼-inch x 8-inch journal axle under an 80,000 pound capacity car. No sir, you have added 150 pounds at least to the weight of axle, increasing the journal to 5 x 9 inches. Now, is it fair to the wheel maker for him to run any chances? We wished to fill the order with weight of wheel 650 pounds. 675 pounds is now the M. C. B. standard for 5-inch x 9-inch axles. Well, he saw the justice of my claim and conceded the point.

The failures of the light weight wheels under the first fifty ton cars brought about the inception of the solid steel wheel to take its place.

It is a pleasure to me to have listened to Mr. Lyndon's and Vial's lecture on the Mechanics of the chilled cast iron wheel. It is a good thing the Association of Car Wheel Makers have gone into the technical stresses and strains the chilled car wheel is subjected to when in service.

MR. A. STUCKI, Engineer: This whole question is one of safety and one of economy. Quite a little has been said about the first point and a good many figures have been submitted regarding the wear and consequent life of a wheel. However, in connection with true economy, I was wondering whether there is not a practical limit as to the weight of a wheel as it takes power to stop and start such masses. The stopping is not so bad, as each car takes care of its own weight, but in starting long trains such as we run today, it must affect the motive power of an engine greatly. Therefore, I would like to know whether any tests or investigations have been made to determine the influence, the weight of the wheels have on the hauling capacity of an engine.

MR. VIAL: That is a rather complicated problem. It depends entirely upon the profile of the road on which the wheels run. There are a great many elements of train resistance such as friction that are of far greater importance than any small additional weight in the wheel. The steel wheel for example has far more frictional resistance against the rail than is developed by the chilled iron wheel.

Coming back to the question of weight: Starting and stopping alone is not very important to a freight train because when once started, a comparatively long run is made without stopping. Excess weight in the wheel is very different from excess weight carried on the car because in the wheel only rolling resistance is encountered while the load on the car is transmitted through the journal to the wheel and then to the rail, having journal friction in addition to rolling friction. Increasing the weight of the wheel 50 or 400 pounds per car represents an increase on the gross load for 100,000 pounds capacity cars of one-quarter of one per cent. and since the rolling friction is about 20 per cent. of the total resistance under average conditions, the increased power required would be 5/100 of 1 per cent. As compared with this, sharp flanges may increase the total resistance 10 per cent. or more. The increased weight on the wheel therefore becomes negligible as compared with other increases in train resistance which are usually overlooked.

An increase in weight of 200 pounds per wheel would require an extra amount of power equivalent to an extra brakeman on each car. It is my experience that if the chilled iron wheel is heavier than the steel wheel, we are told that the hauling of the excess weight is a serious matter but if the steel wheel is heavier than the chilled iron wheel, the cost of hauling the excess weight is ruled out of court. On one occasion I wanted to use a 950 pound wheel under an engine tender but the Master Mechanic would not consent on account of the extreme weight which he said could not be hauled up the hill. I asked him if it required any more effort to haul a 950 pound chilled iron wheel on an up-grade than it did to haul a 1000 pound steel wheel, with which the engine tender was equipped. He said he guessed that I was right and gave an order for the chilled iron wheels.

PRESIDENT: Is there any further discussion? If not, do you wish to say anything further, Mr. Lyndon?

MR. LYNDON: No, I think not.

MR. J. A. SPIELMAN: Mr. President, I move that a vote of thanks be extended to Mr. Lyndon and to Mr. Vial of the Association of Manufacturers of Chilled Car Wheels for this excellent and most valuable paper on the Mechanics of the Chilled Iron Car Wheel.

The motion was duly seconded and prevailed by unanimous vote.

There being no further business,

On Motion, Adjourned.

J.B. Anderson
Secretary.

RAILWAY CLUB NOTES.

The following subjects were presented and discussed by the several Railway Clubs during the month of May, 1917, as noted below:

New York Railroad Club, Harry D. Vought, Secretary,
95 Liberty Street, New York, N. Y.

Subject—"From Ore to National Pipe" by N. C. Nicol.

New England Railroad Club, Wm. E. Cade, Jr., Secretary,
683 Atlantic Avenue, Boston, Mass.

Subject—"Duties of Civilians in War Time" by Charles F. Weed.

Canadian Railway Club, Jas. Powell, Secretary,
P. O. Box 7, St. Lambert, near Montreal, Can.

Subject—Annual Meeting.

Richmond Railway Club, F. O. Robinson, Sec'y, Richmond, Va.

Subject—"Travelogue on Korea" by Admiral Harrie Webster.

St. Louis Railway Club, B. W. Frauenthal, Secretary,
Union Station, St. Louis, Mo.

Subject—"Safety Appliance Standards" by Hiram W. Belnap.

Southern & South Western Ry. Club, A. J. Merrill, Secretary,
Box 1205, Atlanta, Ga.

Subject—Unknown.

Central Railway Club Buffalo, N. Y., Harry D. Vought,
Secretary, 95 Liberty Street, New York, N. Y.

Subject—"The Lubrication of Freight Cars in Interchange" by T. J. Burns.

The Railway Club of Pittsburgh, J. B. Anderson, Secretary,
207 Penna. Station, Pittsburgh, Pa.

Subject—"A General Survey of the Mechanics of the Chilled Iron Car Wheel" by George W. Lyndon.

Copies of the above papers can be had upon application to the Secretary at the address given for a nominal price.

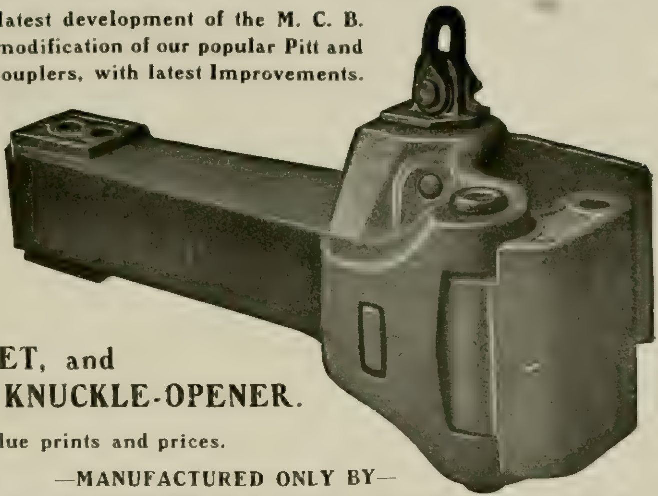
In Memoriam

G. E. TRAUTWEIN

DIED MARCH 27, 1917

THE PENN COUPLER

Our latest development of the M. C. B. Coupler, a modification of our popular Pitt and Janney X Couplers, with latest Improvements.



LOCK-
TO-
THE-
LOCK,

LOCK-SET, and
KNUCKLE-OPENER.

Send for blue prints and prices.

—MANUFACTURED ONLY BY—

THE McCONWAY & TORLEY CO.,
PITTSBURGH, PA.

Our Best Salesman!

Any of the over FORTY Railroad Systems in the United States using our STREET STOKERS and MECHANICAL COAL PUSHERS.

LOCOMOTIVE STOKER CO.

General Office and Works
PITTSBURGH

50 Church Street
NEW YORK CITY

Railway Exchange
CHICAGO

PINTSCH MANTLE LIGHT

The system that has made good wherever it has been applied . . . .

SAFETY ELECTRIC LIGHT

Type "F" regulation ensures constant lamp voltage and long lamp life .

The Safety Car Heating & Lighting Co.

Chicago, Philadelphia, Washington, Boston,
St. Louis, San Francisco, Montreal

2 Rector St., New York

KING

METALLIC PACKINGS

for Locomotive Piston Rods, Valve Stems & Air Pumps

SECURITY WRIST PIN
LEACH SANDERS
GOLLMAR BELL RINGER
INDESTRUCTIBLE OIL CUP
BRAIDED SWAB, ETC.

The U. S. Metallic Packing Co.
PHILADELPHIA

FIREBOX FACTS

1. Big locomotives have long wheel bases.
2. Long wheel bases must be covered by long boilers.
3. Long boilers mean excessive flue lengths.
4. Excessive flue lengths represent investment in heating surfaces of low evaporative values.
5. Shorter flues mean longer fire boxes.
6. Longer fire boxes (with combustion chambers) of the radial stay type are dangerous and introduce added stay bolt troubles.
7. The Jacobs-Shupert sectional fire box (and combustion chamber when required) supplies the means for designing locomotive boilers of correct economic proportions and at the same time for reducing maintenance problems to a minimum.

"YOURS FOR BETTER BOILERS"

Jacobs-Shupert U. S. Firebox Co.

30 Church St., New York. Works: Coatesville, Pa.

RAILWAY STEEL-SPRING COMPANY,

Springs,

Steel Tired Wheels,

Locomotive and Car Wheel Tires.

GENERAL OFFICE, 30 CHURCH STREET, NEW YORK

BRANCH OFFICES:—CHICAGO, ST. LOUIS, ST. PAUL, WASHINGTON, D. C.

WATERVLIET, N.Y.

G-E Motors and Control Increase Production and Reduce Maintenance

Inevitably — you will electrify

SOONER or later the advantages of G-E MOTOR DRIVE are going to become so apparent to you that you will ask our Engineering Organization to study the conditions and requirements of your plant—just as the owners of the equipment here illustrated had us do.

Because of its wide experience in *all* fields of industrial power, the General Electric Company can apply to the solution of *your* power problems a breadth of experience and knowledge to which no other institution can lay claim. Furthermore, the organization and resources of the General Electric Company stand squarely behind every G-E MOTOR DRIVE to insure satisfactory operation.

G-E Motor Drive

GENERAL ELECTRIC COMPANY

General Office, Schenectady N.Y. Sales Offices in all large cities

6804

STANDARD STEEL CAR COMPANY

OFFICES: General Offices: Frick Bldg., PITTSBURGH, PA.
NEW YORK: 170 Broadway
CHICAGO: Fisher Building

WORKS: BUTLER, PA.
NEW CASTLE, PA.
HAMMOND, IND.

STEEL AND COMPOSITE

FREIGHT CARS

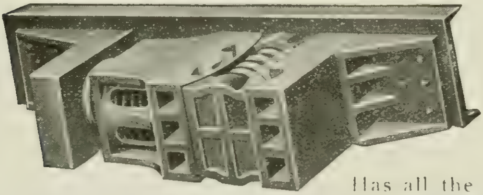
For all Classes of Service, from our Standard Designs, or according to Specifications of Purchasers.

Steel Car Underframes

TRUCKS, BOLSTERS, BRAKE BEAMS, ETC.

Capacity 50,000 Cars per Annum

INQUIRIES SOLICITED



USE BUTLER DRAFT GEARS

FRICTION RIGGING

PIPER PATENTS

200,000 lbs. Capacity.

Has all the points of a Perfect Gear

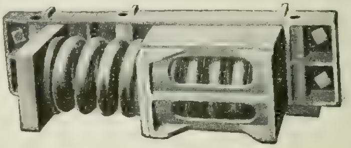
TANDEM SPRING ATTACHMENTS

6¼x8 or 8x8 DRAFT SPRINGS

PERFECT SPRING PROTECTION

Butler Drawbar Attachment Co.

Send for Catalog CLEVELAND, OHIO



SCHAEFER

DROP-FORGED

FOUNDATION BRAKE GEAR DETAILS,

COMBINE

MORE STRENGTH WITH LESS WEIGHT

Schaefer Equipment Company

Oliver Building Pittsburgh, Pa.

STANDARD STEEL PLATFORMS
ARE IN USE BY 281 COMPANIES
SESSIONS—STANDARD FRICTION DRAFT GEARS
ARE IN USE BY 205 COMPANIES
—BOTH MADE BY—
THE STANDARD COUPLER CO.
CHICAGO: People's Gas Building NEW YORK: 30 Church St.

J-M RAILROAD SUPPLIES

Roofings
Packings
Gaskets
Pipe Coverings
Hair Felt
Smoke Jacks
Asbetos Wood
Waterproofing
Corks
Fibre Conduit
Locomotive Lagging
Flexible Armored Squirt,
Tank, Car Heating, Air
Brake and Air Signal Hose
Air Brake Expander Ring
Steel Car Insulation
Underground Conduit
Asbestos Cements
Brake Lining and Blocks
Electrical Supplies
Mastic Flooring
Speedometers
Fire Extinguishers
Manual Slack Take Up
for Air Brakes
Vitribestos Stack Lining
Refrigerator Car Insulation

Write for Catalogs
H. W. JOHNS-MANVILLE COMPANY
NEW YORK CITY
Branches in 54 Large Cities

Union Steel Casting Company,
PITTSBURGH, PA.
Steel Cast Locomotive Frames, Driving
Wheel Centers, and Miscellaneous
Locomotive Castings.
Vanadium Steel Castings a Specialty

VAPOR CAR HEATING CO., Inc.
RAILWAY EXCHANGE CHICAGO
Successors to
Chicago Car Heating Co.
Standard Heat & Ventilation Co., Inc.

NEW YORK
30 Church
WASHINGTON, D. C.
Munsey Bldg.

Montreal,
Que.

BOSTON, MASS.,
53 State Street
ATLANTA, GA.,
Candler Bldg.

Freight and Passenger
CARS
Of Every Description

Pressed Steel Specialties

Tank Cars
Mine Cars

Pressed Steel
Car
Company

New York
Pittsburgh
Chicago
St. Paul

FOR

GREATER EFFICIENCY

USE

DAVIS SOLID-TRUSS BRAKE BEAMS

FOR

Freight and Passenger Equipment.

ALSO

Pressed Steel Journal Box Lids.

DAVIS BRAKE BEAM CO.,

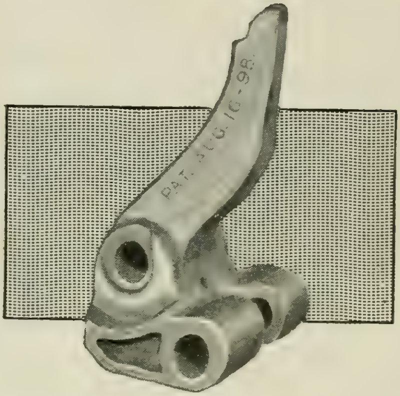
JOHNSTOWN, PA.

FRANK J. LANAHAN, Pres. CHAS. J. GRAHAM, Vice-Pres. H. L. REFLOGLE, Gen'l. Sales Rep

STUCKI
Side Bearings
SAVE WHEELS, RAILS, POWER
AVOID DERAILMENTS

A. Stucki Co.
Oliver Building
PITTSBURGH,
PA.

This Space For Sale



For Those "Break-In-Twos"

AVOID the delays and dangers in chaining up "break-in-twos" and setting out at the first siding. Take your trains right in to terminals coupled up with the Gilman-Brown Emergency Knuckle.

Fits practically all types of M. C. B. couplers with a *close* and *normal* coupling—even where one pin lug is broken from the draw head; air line can be safely coupled up and maintained without dummy hose.

For more than ten years the standard repair knuckle on the leading railways of the country, is your assurance of its economy and dependability.

Let us tell you more about this time saver.
Write for literature.

The Q AND C Co.

NEW YORK
90 West Street

ST. LOUIS
Railway Exchange Bldg.

CHICAGO
Peoples' Gas Bldg.

GILMAN-BROWN
Emergency Knuckle

SUYDAM'S Protective PAINTS
For Freight Cars and Structural Steel Work
—MANUFACTURED BY—
M. B. SUYDAM COMPANY,
OFFICE AND WORKS, 61ST AND BUTLER STS.,
BELL 'PHONE, 343 FISK. PITTSBURGH, PA

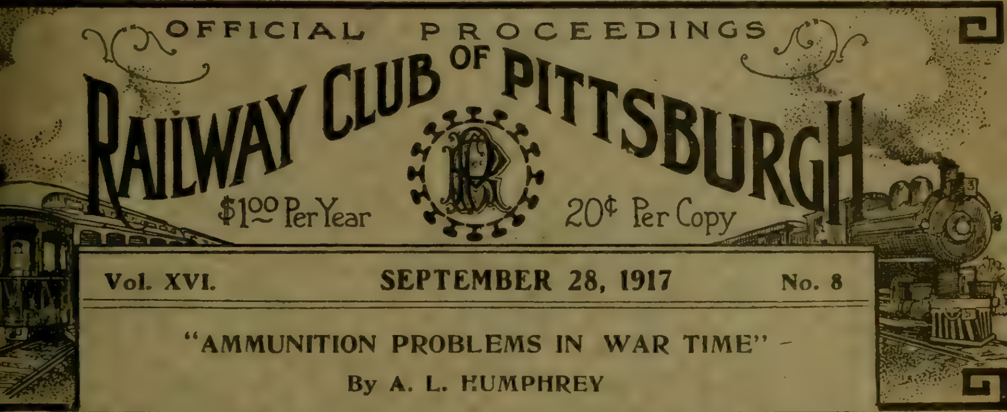
This Space For Sale.

negie Library
sburgh

FOR SALE

BRADY BRASS CO.
MANUFACTURERS OF
CYPRUS BRONZE FOR LOCOMOTIVE and CAR BEARING USE
ENGINE CASTINGS BABBITT METALS
JOURNAL BEARINGS MOTOR BEARINGS
General Office and Works, 170-182 Fourteenth St. and 169-175 Fifteenth St., Jersey City, N. J.
DANIEL M. BRADY, PRESIDENT

TYPE A SUPERHEATER LOCOMOTIVES
Make firing easier Save coal and water
Haul longer trains Maintain faster schedules
LOCOMOTIVE SUPERHEATER COMPANY
30 Church St., New York. Peoples Gas Bldg., Chicago.



OFFICIAL PROCEEDINGS
RAILWAY CLUB OF PITTSBURGH
$1.00 Per Year 20¢ Per Copy
Vol. XVI. SEPTEMBER 28, 1917 No. 8

"AMMUNITION PROBLEMS IN WAR TIME"

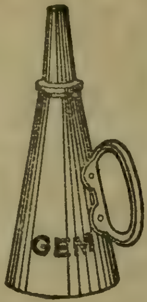
By A. L. HUMPHREY

Drop Forgings from ½ to 100 Pounds
STEEL CAR FORGE COMPANY
"FORGING SPECIALISTS"
PITTSBURGH NEW YORK CHICAGO

FOR SALE

ARISTOS
"COPPERWELD"
Electrical Uses Mechanical Uses
A COPPER CLAD STEEL WIRE
Product of the COPPER CLAD STEEL CO., Pittsburgh, Pa.
Drawn and Sold Exclusively by
PAGE WOVEN WIRE FENCE CO., - - Monessen, Pa.

FOR SALE



TORCHES

Gem Torches Save You Money

Exhaustive tests by largest railway systems have proven that Gem Brazed Seam Torches do save money. Let us prove it. Send for free sample and information.

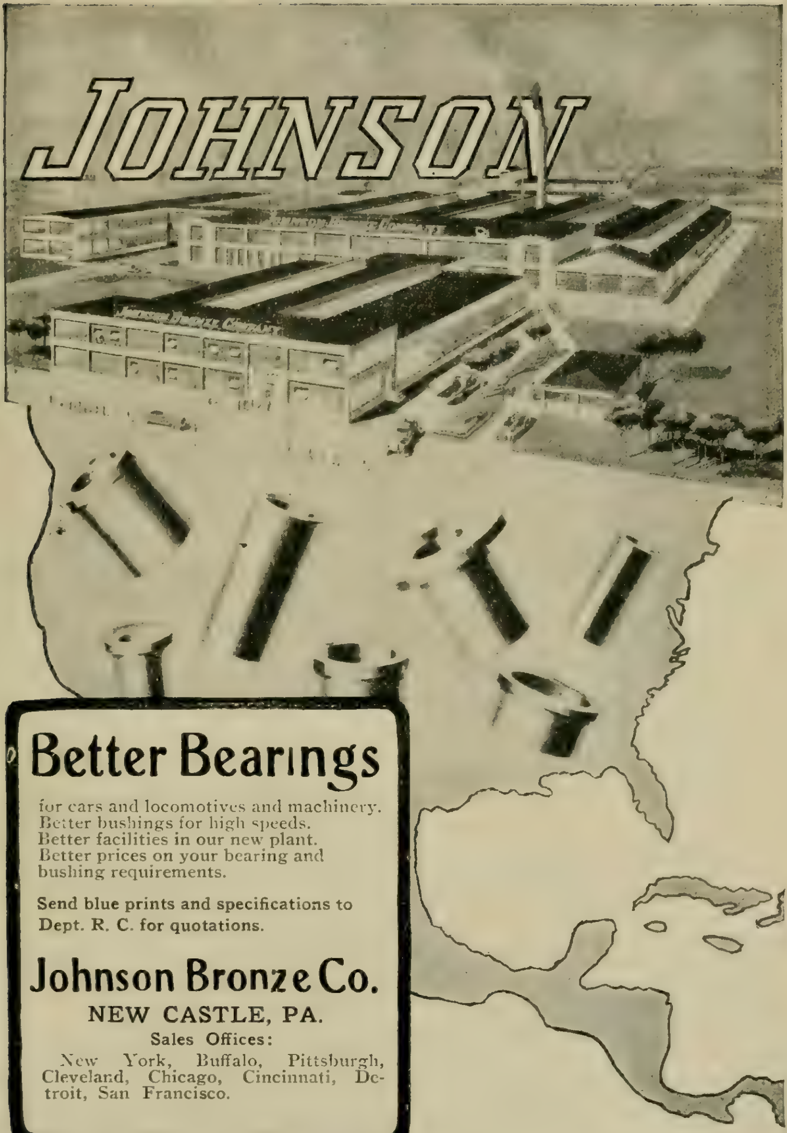
Gem Manufacturing Company
PITTSBURGH, PA.

Graham Nut Company
PITTSBURGH, PA.

MANUFACTURERS OF

Hot Pressed Nuts, Cold Punched C. & T. Nuts
Bolts, Lag Screws, Washers, Etc.

This Space For Sale



Better Bearings

for cars and locomotives and machinery.
Better bushings for high speeds.
Better facilities in our new plant.
Better prices on your bearing and bushing requirements.

Send blue prints and specifications to Dept. R. C. for quotations.

Johnson Bronze Co.

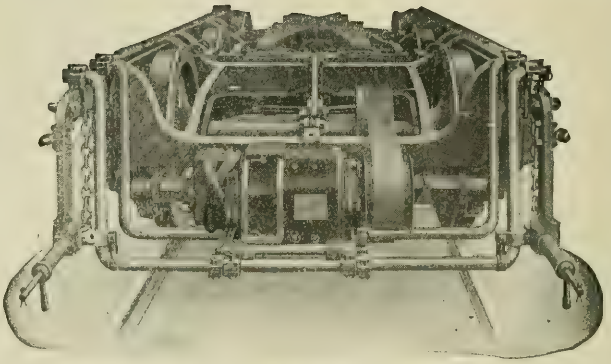
NEW CASTLE, PA.

Sales Offices:

New York, Buffalo, Pittsburgh, Cleveland, Chicago, Cincinnati, Detroit, San Francisco.

THE GOULD "SIMPLEX" SYSTEM OF

ELECTRIC CAR LIGHTING

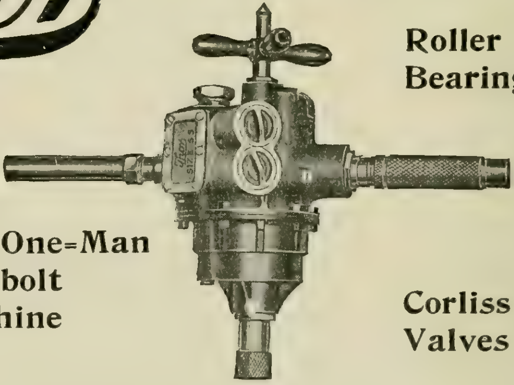


GOULD COUPLER CO.

NEW YORK

Thor

Roller-Bearing Compound
Piston Air Drills



Roller
Bearings

No. 32
L

The One=Man
Staybolt
Machine

Corliss
Valves

FURNISHED ON TRIAL FREE. WRITE NEAREST BRANCH

INDEPENDENT PNEUMATIC TOOL COMPANY

Chicago : New York : Pittsburgh : Detroit : San Francisco : Birmingham : Montreal, Que.

MANNING, MAXWELL & MOORE,

ROBT. A. BOLE, MANAGER, PITTSBURGH BRANCH

PARK BUILDING

LONG DISTANCE TELEPHONE CALL. GRANT 67

Railway and Machinists' Tools and Supplies, Electric Traveling Cranes, Compressors, Pneumatic Hoists, Riveters and complete Machine Shop and Foundry Equipment

---

NATIONAL CAR WHEEL COMPANY

MANUFACTURERS OF

"STAR SPECIAL"

Reg. U. S. Patt. Off.

CHILLED CAST IRON CAR WHEELS

WORKS:
Rochester, N. Y. Pittsburgh, Pa.
Sayre, Pa. Cleveland, O.
New York City, N. Y.

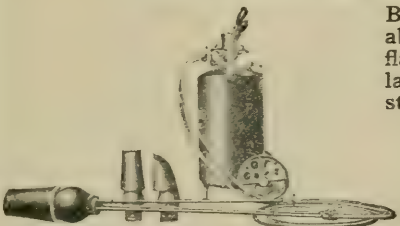
General Offices:
PITTSBURGH, PA.
New York Office:
556 WEST 34th STREET
Phila. Office:
506 FRANKLIN BANK BLDG.

BRAKE SHOES

AMERICAN BRAKE SHOE
& FOUNDRY COMPANY

30 Church St., New York
322 So. Michigan Ave., Chicago
Chattanooga, Tenn.

MAHR PATENT NO. 1-C TORCH FOR STEEL CAR REPAIRING



Burns the cheapest oil obtainable and produces a big intense flame that will quickly heat the largest sills, bolsters and other steel parts for straightening.

Mahr Manufacturing Co.

MINNEAPOLIS

NATHAN MANUFACTURING CO.
Amity and Lawrence Streets
FLUSHING, LONG ISLAND, N. Y.

1612 Old Colony Building, Chicago.

Monitor, Simplex and Nathan Injectors for Locomotives
AND
Sight-Feed Lubricators.

All Specially arranged for High-Pressure Engines.

STEAM FIRE EXTINGUISHERS FOR SWITCHING AND YARD ENGINES.

Boiler Washers, Boiler Testers, Rod and Guide Oil Cups, Etc.

—— SOLE AGENCY FOR THE ——

Coale Muffler & Safety Valve Co., Inc.

SIPE'S No JAPAN OIL
TRADE MARK REGISTERED
J.B. SIPE & CO
MANUFACTURERS.
ALLEGHENY, PA.

ESTABLISHED 1864

SIPE'S JAPAN OIL

"STRENGTHENS, DRIES, AND WATERPROOFS;
Add Sipe's Japan Oil And Improve the Paint".

IN DAILY USE BY ALL THE LEADING RAILROADS IN THE UNITED STATES

MANUFACTURED ONLY BY

CHICAGO ILL. **JAMES B. SIPE & CO.** PITTSBURGH, PA.

LOCOMOTIVE BLOW-OFF

DOES SATISFACTORY WORK ON MANY ROADS.

Can be worked from cab or foot board while running.

A catalog or call by Representative for the asking.

Homestead Valve Mfg. Co.,
Works: Homestead, Pittsburgh, Pa.

=: FARLOW DRAFT ATTACHMENT :=

For { **TWIN M. C. B. DRAFT SPRINGS**
OR
FRICTION DRAFT GEARS }

THE T. H. SYMINGTON CO.

New York Chicago Baltimore Rochester

BALL'S
VARNISH REMOVER

OXOLIN
REGISTERED
THE IDEAL PAINT OIL

B. C.
SPIRITS

Ball Chemical Co.

CHICAGO Office,
63 W. Van Buren Street.

Fulton Bldg., PITTSBURGH, PA.

Logical Construction
is a feature of
BOYER
Pneumatic Hammers

No. 80X Boyer Riveting Hammer. Capacity 1⅜ inches.
Length overall only 21⅜ inches.

Boyer Hammers are made in three parts, cylinder, handle and valve—a construction which facilitates examination, cleaning and repairs, and extends the life of the tool indefinitely.

Write for Hammer Bulletin 124.

CHICAGO PNEUMATIC TOOL CO.

PITTSBURGH: 10 and 12 Wood St

1052 Fisher Bldg.
CHICAGO

Branches Everywhere

52 Vanderbilt Ave.
NEW YORK

H. H. HEWITT, PRESIDENT. W. H. CROFT VICE-PRESIDENT

MAGNUS METAL

MEETS ALL HIGH-GRADE REQUIREMENTS.

IT IS THE STANDARD METAL

FOR LOCOMOTIVE WEARING PARTS,

JOURNAL BEARINGS FOR { FAST PASSENGER CAR SERVICE, HEAVY FREIGHT CAR SERVICE.

MAGNUS COMPANY

111 BROADWAY, NEW YORK.

DURABILITY COUNTS

DIXON'S SILICA GRAPHITE PAINT

is the "LONGEST SERVICE" paint. Recommended and largely used as standard by railroad economists, and engineers, throughout the entire world, for bridges, steel cars, tanks, signal apparatus etc. Made in FIRST QUALITY only. Write us for long service records and booklet No. 152-B.

Made in JERSEY CITY, N. J., by the

JOSEPH DIXON CRUCIBLE COMPANY

ESTABLISHED 1827

THE NATIONAL

Coiled Spring Journal Box

Dust Proof, Oil Tight, Easily Opened and Closed. Simple, Light and Strong

Manufactured Exclusively by

The National Malleable Castings Co.

CLEVELAND CHICAGO INDIANAPOLIS TOLEDO
SHARON, PA. MELROSE RARK. ILL.

PEERLESS

MECHANICAL RUBBER GOODS AND PACKINGS HAVE THAT DURABILITY DEMANDED BY RAILROADS.

Peerless Rubber Mfg. Co.

31 WARREN ST. NEW YORK

BOSTON CHICAGO PHILADELPHIA MINNEAPOLIS

Specialization

Produces Highest Efficiency

* * * * *

Air Brake building is a business in itself—and one of the most important, because of the lives and property the Air Brake protects. It is a specialist's business, and to obtain best results, should be conducted by specialists.

* * * * *

Westinghouse Air Brake Co.

General Offices and Works, Wilmerding, Pa.

Westinghouse
Electric Arc Welding Outfits

have reduced the repair costs in many railroad shops.
They save their cost in three months time.
Full information on request.—Booklet 3049-A.

Westinghouse
Electric Motors for Railroad Shops

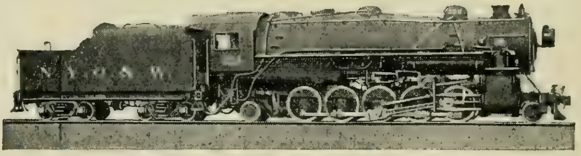
Pressed-Steel Types for either alternating or direct current. Rugged, serviceable, efficient and long lived.
Full information on request.

Westinghouse Electric & Manufacturing Co.

Sales Offices In All
Large American Cities

EAST PITTSBURGH
PENNSYLVANIA

2-10-2 TYPE LOCOMOTIVES



Total Weight of Engine, 352,500 pounds; Weight on Drivers, 293,000 pounds; Diameter of Drivers, 57 inches; Tube Length, 17 feet; Boiler Pressure, 190 pounds; Cylinders, 28x32 inches; Maximum Tractive Power, 71,200 pounds.

Because of its long rigid wheel base many railroad officials have had to eliminate the 2-10-2 type when considering more powerful locomotives.

Lateral motion driving axles and boxes were applied to the New York, Ontario & Western, 2-10-2 type locomotives to reduce the rigid wheel base to that which is in common use on Consolidation and Mikado type locomotives, and at the same time secure the advantages of the ten-coupled wheel arrangement with the resulting increased capacity of the locomotives.

Write us for further information regarding the lateral motion device

AMERICAN LOCOMOTIVE COMPANY

30 CHURCH STREET, NEW YORK

YOU GET THE MAXIMUM OF DURABILITY FROM OUR

SEMAPHORE ENAMEL

All colors—Write to us for samples.

Yarnall Paint Company

MANUFACTURERS - - - PHILADELPHIA

READING SPECIALTIES COMPANY

GENERAL OFFICE AND WORKS, READING, PA.

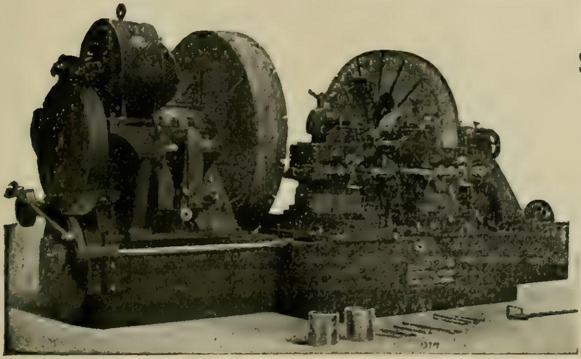
BRANCH OFFICES

New York, 111 Broadway
Chicago, Railway Exchange Bldg.
Atlanta, Fourth Nat'l. Bank Bldg.
Washington, Colorado Building.
Pittsburgh, Oliver Building.
Denver, First National Bank Bldg.
Los Angeles, W. H. Hel man Bldg.

"Reading" Guard Rail Clamps
"Reading" Rail Benders
"Reading" Rerailers & Clamps
"Reading" Compromise Joints

Railroad Repair Shop Equipment

Combining all modern features for rapid, convenient operation.



MACHINE TOOLS

STEAM HAMMERS

ELECTRIC TRAVELING CRANES

P. & W. SMALL TOOLS AND M. C. B. GAUGES

WRITE FOR CATALOGU

Niles New Model Driving Wheel Lathe
Has broken all wheel shop records.

NILES-BEMENT-POND CO

111 Broadway, New York. Pittsburgh Office, Frick Building.

---

500 RAILROAD SHOPS

Have Adopted Thermit Welding as a Standard for Frame Repairs

The list of railroads using Thermit includes practically every system from the small road having only a few locomotives to the largest system having many thousand locomotives.

The superheated liquid Thermit steel is produced in bulk and poured all at once into a mold surrounding a broken section, resulting in the perfect amalgamation of the Thermit steel with the parts with which it comes in contact. The fact that those parts are first preheated, makes the weld doubly sure.

Remember that the greatest railway systems in the world use hundreds of thousands of pounds of Thermit. They do not use it for any reason except that it "delivers the goods," and has proved itself the most profitable investment.

Full information is given in our instructive pamphlet No. 2167, "Thermit Locomotive Repairs," and shows how effectively and economically the process can be used. Send for a copy today.

GOLDSCHMIDT THERMIT COMPANY

120 BROADWAY, NEW YORK
329-333 Folsom St., San Francisco; 103 Richmond St., W.,
Toronto, Ont.; 7300 So. Chicago Ave., Chicago

THE BALDWIN LOCOMOTIVE WORKS

PHILADELPHIA, PA., U. S. A.

LOCOMOTIVES

OF EVERY DESCRIPTION

Electric Motor and Trailer Trucks

SECURITY

SECTIONAL ARCH

Makes staybolt inspection easy.
Saves flue troubles.
Reduces engine failures.
Easy to apply and remove.
Small brick of light weight.
Cools off quickly.
Many other good features.

AMERICAN ARCH COMPANY

30 Church Street,
New York

McCormick Building,
Chicago

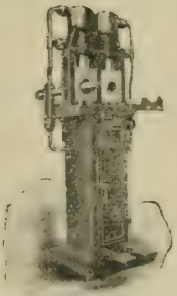
The Best Staybolt
FOR LOCOMOTIVE FIREBOXES

Railroads Are Now Using
The Tate Flexible Staybolt
At the Rate of
1,250,000 A YEAR

Our Services Are Always
At Your Command

FLANNERY BOLT CO.
Vanadium Building
PITTSBURGH, PENNA.
B. E. D. Stafford, General Manager

J. Rogers Flannery & Co.
SELLING AGENTS
Vanadium Building
PITTSBURGH, PENNA.



The Draper Manufacturing Co.
Manufacturers of
PNEUMATIC FLUE WELDERS

For Scarfing, Welding and Swedging Boiler Flues up to 4" Diameter.

Pneumatic Tube Welding Machines for Welding and Swedging Superheater Tubes.

Flue Reclaiming Equipment used in connection with Pneumatic Flue Welders.

HUNT-SPILLER IRON
HAS THE
STRENGTH AND WEARING QUALITIES
THAT ARE ABSOLUTELY NECESSARY IN
LOCOMOTIVE CASTINGS
PRICES MODERATE RESULTS GREAT
Manufactured Only By
Hunt-Spiller Manfg. Corporation
W. B. LEACH, President and Gen'l Manager.
J. G. PLATT,
Sales Manager.

OFFICE AND WORKS:
3 DORCHESTER AVENUE
SO. BOSTON, MASS.

GALENA-SIGNAL OIL COMPANY

FRANKLIN, PENNA.

Sole manufacturers of celebrated

GALENA LUBRICANTS

PERFECTION VALVE and SIGNAL OILS

and

Galena Railway Safety Oil

Manufactured for

STEAM AND ELECTRIC RAILWAY USES EXCLUSIVELY

Guaranteed Cost **Expert Service Free**

CHARLES MILLER,
Chairman.

S. A. MEGEATH,
President.

FORT PITT MALLEABLE IRON CO.

PITTSBURGH, PENNA.

MANUFACTURING SPECIALISTS
OF MALLEABLE CASTINGS
FOR THE RAILROAD AND
CAR COMPANY TRADE.

FEATURES

Superior Quality

Expeditious Delivery

Consistent Price

INDEX—ADVERTISERS.

NAME Page
American Arch Co. ... x
American Brake Shoe & Foundry Co. ... iii
American Locomotive Company ... viii
Baldwin Locomotive Works ... x
Ball Chemical Co. ... v
Brady Brass Co. ... Front Cover
Butler Drawbar Attachment Co. ... xviii
Chicago Pneumatic Tool Co. ... v
Davis Brake Beam Co. ... xxi
Dixon, Jos., Crucible Co. ... vi
Flannery Bolt Co. ... xi
Fort Pitt Malleable Iron Co. ... xii
Galena Signal Oil Co. ... xii
General Electric Co. ... xvii
Gem Manufacturing Co. ... Front Cover
Goldschmidt Thermit Co. ... ix
Gould Coupler Co. ... ii
Graham Nut Company ... Front Cover
Homestead Valve Mfg. Co. ... iv
Hunt-Spiller Mfg. Co. ... xi
Independent Pneumatic Tool Co. ... ii
Johns-Manville Co. ... xix
Johnson Bronze Co. ... i
Locomotive Stoker Co. ... xv
Locomotive Superheater Co. ... Front Cover
Magnus Company ... vi
Mahr Manufacturing Co. ... iii
Manning, Maxwell & Moore ... iii
McConway & Torley Company ... xv

NAME Page
Nathan Manufacturing Co. ... iv
National Car Wheel Co. ... iii
National Malleable Castings Co. ... vi
Niles-Bement Pond Co. ... ix
Page Woven Wire Fence Co. ... Front Cover
Peerless Rubber Mfg. Co. ... vi
Pressed Steel Car Co. ... xx
Reading Specialties Co. ... viii
Railway Steel Spring Co. ... xvi
Safety Car Heating & Lighting Co. xvi
Schaefer Equipment Co. ... xviii
Sipe, James B., & Co. ... iv
Standard Coupler Co. ... xix
Standard Steel Car Co. ... xviii
Steel Car Forge Co. ... Front Cover
Stucki Co., A. ... xxi
Suydam, M. B. Co. ... Back Cover
The T. H. Symington Co. ... v
The Draper Manf'g Co. ... xi
The Q. & C. Co. ... xxii
The U. S. Metallic Packing Co. ... xvi
Union Spring & Mfg. Co. ... xiv
Union Steel Casting Co. ... xix
Vapor Car Heating Co., Inc. ... xix
Westinghouse Air Brake Co. ... vii
Westinghouse Electric & Mfg. Co. .. vii
Yarnall Paint Co. ... viii

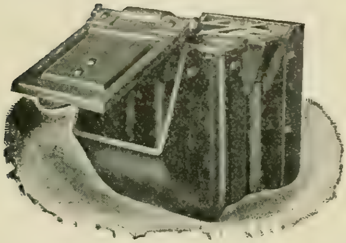
Union Spring & Manufacturing Co.

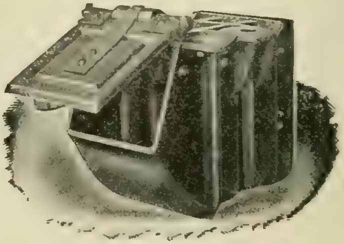
SPRINGS

Kensington All Steel Journal Boxes

PRESSED STEEL JOURNAL BOX LIDS

STEEL CASTINGS





Lightest and Strongest M. C. B.
Journal Boxes Made.

WORKS:

NEW KENSINGTON, PA.

GENERAL OFFICE:

First National Bank Bldg., Pittsburgh, Pa.

NEW YORK - 50 Church Street.
CHICAGO - Fisher Building.
ST. LOUIS - Missouri Trust Building.
RICHMOND, VA., AMERICAN NATIONAL BANK BUILDING.
LOUISVILLE, KY., 42 Todd Building.

OFFICIAL PROCEEDINGS

OF

The Railway Club of Pittsburgh

Organized October 18, 1901.

Published monthly, except June, July and August, by The Railway Club of Pittsburgh, J. B. Anderson, Secretary. General Offices, Penna. R. R., Pittsburgh, Pa.

Entered as Second Class Matter February 6, 1915, at the Postoffice at Pittsburgh, under the Act of March 3, 1879.

Vol. XVI. No. 8. **Pittsburgh, Pa., September 28, 1917.** $1.00 Per Year 20c Per Copy

OFFICERS FOR 1916—1917

President

J. G. CODE,
General Manager, Pgh. & W. Va. Ry.
Pittsburgh, Pa.

First Vice President

H.H. MAXFIELD,
Supt. Motive Power, P. R. R.,
Pittsburgh, Pa.

Second Vice President

D. M. HOWE,
Paint Expert,
Pittsburgh, Pa.

Secretary

J. B. ANDERSON,
Chief Clerk, Supt. M. P., P. R. R.,
Pittsburgh, Pa.

Treasurer

F. H. STARK,
Genl. Supt., Montour R. R.,
Coraopolis, Pa.

Executive Committee

L. H. TURNER, Supt. Motive Power, P. & L. E. R. R., Pittsburgh, Pa.
D. J. REDDING, Asst. Supt. Motive Power, P. & L. E. R. R., McKees Rocks, Pa.
F. R. McFEATTERS, General Supt. Union R. R., East Pittsburgh, Pa.
A. G. MITCHELL, Supt. Monon. Div., Penna. R. R , S. S., Pittsburgh, Pa.
F. M. McNULTY, Supt. Motive Power, Monon. Conn. R. R., Pittsburgh, Pa.

Finance Committee

STEPHEN C. MASON, Secretary, The McConway & Torley Co., Pittsburgh, Pa.
E. K. CONNEELY, Asst. to Vice President, P. & L. E. R. R., Pittsburgh, Pa.
CHAS. A. LINDSTROM, Asst. to President, Pressed Steel Car Co., Pittsburgh, Pa.
L. C. BIHLER, Traffic Manager, Carnegie Steel Co., Pittsburgh, Pa.
WALTER V. TURNER, Asst. Manager,
Westinghouse Air Brake Co., Wilmerding, Pa.

Membership Committee

FRANK J. LANAHAN, President, Fort Pitt Malleable Iron Co., Pittsburgh, Pa.
A. STUCKI, Engineer, Pittsburgh, Pa.
C. O. DAMBACH, Supt., Pgh. & W. Va. Ry., Pittsburgh, Pa.
HARRY HOWE, Inspector of Castings, Pressed Steel Car Co., McKees Rocks, Pa.
R. L. KLEINE, Chief Car Inspector, P. R. R., Altoona, Pa.
B. E. D STAFFORD, General Manager, Flannery Bolt Company, Pittsburgh,Pa.
SAMUEL LYNN, Master Car Builder, P. & L. E. R. R., McKees Rocks, Pa.

Entertainment Committee

D. H. AMSBARY, District Manager, Dearborn Chemical Co., Pittsburgh, Pa.
HARRY MURDOCH, President, H. Murdoch & Co., Pittsburgh, Pa.
E. C. SATTLEY, General Manager, Page Woven Wire Fence Co., Monessen, Pa.

Past President

J. H. McCONNELL	October, 1901, to October, 1903.
L. H TURNER	November, 1903, to October, 1905.
F. H. STARK	November, 1905, to October, 1907.
* H. W. WATTS	November, 1907, to April, 1908.
D. J. REDDING	November, 1908, to October, 1910.
F. R. McFEATTERS	November, 1910, to October, 1912.
A. G. MITCHELL	November, 1912, to October, 1914.
F. M. McNULTY	November, 1914, to October, 1916.

* Deceased.

Meetings held fourth Friday of each month, except June, July and August.

PROCEEDINGS OF MEETING, SEPTEMBER 28, 1917.

The regular monthly meeting was called to order in the Assembly Room of the Commercial Club at 8 o'clock, P. M., with President J. G. Code in the chair.

The following gentlemen registered:

MEMBERS

Amsbary, D. H.
Anderson, A. E.
Anderson, J. B.
Arnold, J. G.
Arnold, J. J.
Babcock, F. H.
Barth, J. W.
Berg, K.
Berghane, A. L.
Brock, Jesse
Buckbee, W. A.
Calvin, A. W.
Chester, C. J.
Chilcoat, H. E.
Clark, C. C.
Clark, Chas. H.
Cline, W. A.
Code, J. G.
Copeland, T. T.
Courtney, D. C.
Crenner, J. A.
Dambach, C. O.
Dickinson, F. W.
Douglass, W. N.
Dudley, S. W.
Duffy, J. F.
Elsey, W. A.
England, A.
Farquhar, L. A.
Flinner, J.
Flinn, R. H.
Forrest, C. H.
Frey, A. R.
Fulton, A. M.
Gies, George E.
Gilg, H. F.
Grafton, N. M.
Guay, J. W.
Haynes, J. E.
Hoffstot, H. P.
Houser, H.
Howe, D. M.
Humphrey, A. L.
James, Robert E.
Jungbluth, A.
Kohl, H. J.
Kummer, Joseph H.
Lanahan, Frank J.
Lansberry, W. B.
Laurent, G. F.
Lindstrom, Chas. A.
Llewelyn, W. R.
Lobez, P. L.
Long, R. M.
Lynn, Saml.
Marshall, W. T.
Mason, Stephen C.
Meyers, J. M.
Millar, C. W.
Millar, R. J.
Mitchell, John
Mode, H. C.
Moore, F.
McCollum, George C.
McDonnell, F. V.
McFarland, H. L.
McKinstry, C. H.
McNulty, F. M.
Newburn, T. W.
Orchard, Charles
Parke, F. H.
Patterson, J. E.
Pehrson, A. K.
Pennington, F. W.

Perkins, Charles F.
Pratt, I. D.
Proven, John
Ralph, J. E.
Redding, D. J.
Sampson, W. F.
Sandman, A. G.
Sattley, E. C.
Schaich, W. L.
Schultz, G. H.
Seiss, Wm. C.
Sewell, H. B.
Shorthill, R. R.
Smith, J. B.
Snyder, J. Rush
Spielmann, J. A.
Stephenson, B. S.
Stillings, Wm. R.
Stucki, A.
Thomas, F. B.
Thomas, J. H.
Trainer, M. N.
Turner, Walter V.
Warne, J. C.
Wegener, H.
Wilder, H. W.
Williamson, J. A.
Wilson, J. T.
Wright, J. B.
Yungbluth, B. J.

VISITORS

Bansbach, L. A.
Burk, Wm. T.
Burson, H. A.
Davis, David
Demarest, T. W.
Dewson, E. H.
Fander, W. J.
Flacius, E.
Flemming, H. W.
Garratt, L. W.
Gibson, William
Gies, Chas. J. A.
Gove, Wm. G.
Harris, C. M.
Herman, Ralph
Keagy, C. O.
Kelly, L. J.
Kennedy, W. R.
King, S. A., Jr.
Laughlin, E. A.
Ludgate, B. A.
Maliphant, C. W.
Maylock, E. A.
McConahey, S. C.
Osborne, A. S.
Palmer, E. A.
Redding, R. D.
Rodgers, E. F.
Rominger, L. T.
Roy, M. J.
Shuss, C. A.
Smith, Chas. H., Jr.
Smith, Louis A.
Sparks, H. D.
Stenson, G. A.
Young, C. C.

The roll call was dispensed with, the record of attendance being had from the registry cards.

The reading of the minutes of the last meeting was dispensed with, as the Official Proceedings had been printed and distributed to the members.

The President introduced Mrs. A. W. Crouch, the wife of a former officer of the Club, who made a brief address, presenting the origin, purposes and activities of the American Red Star Animal Relief Association, an organization which undertakes to do the same work for the animals of the armies that the Red

Cross does for the soldiers. The movement started with the Royal Society for the Prevention of Cruelty to Animals in England, and as an indication of the scope and effectiveness of its work, the speaker said that the sum of $300,000 raised by voluntary private subscription, within a period of eighteen months saved to the English government and turned back into service 150,000 animals, valued at $21,000,000. And the absolute necessity of these animals in war—the popular conception to the contrary notwithstanding—may be learned from the fact that mechanical transportation stops five miles back of the trenches and every pound of materials must be transported by horses and mules from there to the firing line. And in doing this work 5,000 horses are killed each week for every mile of fighting line.

The Secretary then read the following list of applications for membership:

Armstrong, J. C., Acting Train Master, Penna. R. R., 3000 Sarah Street, S. S., Pittsburgh, Pa. Recommended by A. G. Mitchell.

Cunningham, J. L., Superintendent Motive Power, Penna. R. R., 207 Penna. Station, Pittsburgh, Pa. Recommended by J. B. Anderson.

Dice, Urban E., Foreign Advertising Manager, Gazette-Times and Chronicle Telegraph, Gazette Square, Pittsburgh, Pa. Recommended by D. M. Howe.

Greene, W. F., Division Engineer, Penna. R. R., 3000 Sarah Street, Pittsburgh, Pa. Recommended by A. G. Mitchell.

Mason, Howard P., Civil Engineer, Penna. Lines West, 855 Jackman Avenue, Avalon, Pa. Recommended by Stephen C. Mason.

McDowell, D. W., Chief Chemist, Page Woven Wire Fence Co., Box 300, Monessen, Pa. Recommended by E. C. Sattley.

McKenzie, C. L., President, Pittsburgh Construction Company, 808 Diamond Bank Building, Pittsburgh, Pa. Recommended by J. A. Spielmann.

Nieman, C. J., Secretary-Treasurer Penna. Iron & Steel Co., Creighton, Pa. Recommended by D. M. Howe.

Slutzker, Joseph, Assistant Engineer Motive Power, Penna. R. R., 203 Penna. Station, Pittsburgh, Pa. Recommended by J. B. Anderson.

Spear, A. E., Superintendent, P. A. & McK. R. R., McKees Rocks, Pa. Recommended by D. H. Amsbary.

Stevenson, F. M., Engineer, Penna. Tank Car Co., 49 Jefferson Avenue, Sharon, Pa. Recommended by D. H. Amsbary.

Walker, J. W., General Air Brake and Steam Heat Inspector, Penna. R. R., 207 Penna. Station, Pittsburgh, Pa. Recommended by J. B. Anderson.

PRESIDENT CODE: Upon approval by the Executive Committee, the applicants whose names have just been read will become members without further action, except the payment of one year's dues.

SECRETARY ANDERSON: At a previous meeting of the Club the President appointed a Nominating Committee to report on nominations of officers of the Club for the ensuing year beginning November 1st. That Committee submits the following report:

Your Nominating Committee begs leave to make the following report on nomination of officers for the coming Club year:

PRESIDENT:

D. M. Howe, Railway Supplies.

FIRST VICE-PRESIDENT:

J. A. Spielmann, Assistant to General Supt. B. & O. R. R.

SECOND VICE-PRESIDENT:

L. C. Bihler, Traffic Manager, Carnegie Steel Company.

TREASURER:

F. H. Stark, General Superintendent, Montour R. R.

SECRETARY:

J. B. Anderson, Chief Clerk to Supt. Motive Power, P. R.R.

EXECUTIVE COMMITTEE:

L. H. Turner, Supt. Motive Power, P. & L. E. R. R.
D. J. Redding, Asst. Supt. Motive Power, P. & L. E. R. R.
F. R. McFeatters, General Superintendent, Union R. R.
A. G. Mitchell, Superintendent, Penna. R. R.
F. M. McNulty, Supt. Motive Power, Monon. Conn. R. R.
J. G. Code, Retiring President.

FINANCE COMMITTEE:

Stephen C. Mason, Secretary, The McConway & Torley Co.
E. K. Conneely, Asst. to Vice-President, P. & L. E. R. R.
Chas. A. Lindstrom, Asst. to President, Pressed Steel Car Co
Walter V. Turner, Manager of Engineering, Westinghouse Air Brake Co.
Frank J. Lanahan, President, Fort Pitt Malleable Iron Co.

MEMBERSHIP COMMITTEE:

A. Stucki, Engineer.
C. O. Dambach, General Manager, Unity Railways Co.
P. F. Smith, Jr., General Superintendent Motive Power, Pennsylvania Lines West.
R. L. Kleine, Chief Car Inspector, Penna. R. R.
B. E. D. Stafford, General Manager, Flannery Bolt Co.
Samuel Lynn, Master Car Builder, P. & L. E. R. R.
Harry C. Graham, President, Graham Nut Company.

ENTERTAINMENT COMMITTEE:

D. H. Amsbary, District Manager, Dearborn Chemical Co.
Harry Murdoch, President, H. Murdoch & Co.
E. C. Sattley, General Mgr., Page Woven Wire Fence Co.

Signed D. J. REDDING,
F. R. MCFEATTERS,
A. G. MITCHELL,
Committee.

PRESIDENT CODE: What is your pleasure with reference to this report of the Committee on Nominations?

ON MOTION of Mr. A. E. Anderson, duly seconded and carried by unanimous vote, the report was accepted and the usual letter ballot ordered to be sent out in accordance with the By-Laws of the Club.

The Secretary announced the death of Harry L. Allen, Assistant Fourth Vice-President of the American Steel Foundries, Cleveland, O., on August 31, 1917 and Laurence W. Frank, Secretary, Duquesne Steel Foundry Company, Pittsburgh, who died on April 30, 1917.

PRESIDENT CODE: I will ask the Secretary to make a memorial minute of these two deaths in our Official Proceedings.

SECRETARY ANDERSON: The following Resolution has been presented by Mr. D. M. Howe:

"RESOLVED, by The Railway Club of Pittsburgh, that any of its members who have now, or who may, during the present world's war, become one of our Country's defenders by joining the Military or Naval Forces of the United States, or who by reason of membership in the American Red Cross are called away from home, shall be exempt from dues and continues as members in good standing until their return home from the War, and that the Secretary shall prepare a Roll of Honor showing such members for the records of the Club."

ON MOTION the Resolution was unanimously adopted.

The President announced that, in accordance with our usual custom the October meeting will be a social meeting and will be held at the German Club, and the Entertainment Committee was directed to make such arrangements as they deem necessary and proper in connection therewith.

The President also announced that desirable speakers had not yet been secured for the November and December meetings, and requested any member who could do so to suggest names of possible speakers to the Executive Committee or the Secretary. The officers would appreciate these suggestions, as they wish to fully meet the wishes of the membership in the selection of speakers and subjects to be presented.

PRESIDENT CODE: For your instruction and entertainment tonight we are privileged to have a treatment of the subject of "Ammunition Problems in War Times," to be presented by Mr. A. L. Humphrey, Vice-President and General Manager of the Westinghouse Air Brake Company. We can well feel that the Club is to be congratulated that in this instance, as in some others, there may be found within its own membership the talent to present this most interesting subject in a most interesting way. Mr. Humphrey needs no introduction to this Club. He will now have the floor.

AMMUNITION PROBLEMS IN WAR TIME

By A. L. Humphrey, Vice-President and General Manager Westinghouse Air Brake Company

It is safe to say that the thought uppermost in the minds of all present tonight, is how can I do my mite in this great world's conflict; and being prompted by this spirit, is my apology for being here on this occasion.

The divergency of views expressed and the lack of unity and dispatch in the work of Congress, even since our declaration of war, or rather our recognition of a state of war, compels us to admit that the United States can hardily be recognized as a cohesive nation. We have been too much inclined to be selfish, much too busy in becoming bigger and wealthier, to consider the public weal in the way it should be considered. Unless we learn to subordinate our individual selfishness, and this includes all, regardless of affiliations, nationality, creed or race, to a general recognition of broad public rights and needs, we cannot hope for the most effective co-operation in this time of war. As a nation we are yet young and childish, and immature in many of our judgments. We are self-confident and physically strong and exuberant. We have looked back upon our brief history with eyes and minds that tend to enlarge upon our national accomplishments. We have not looked forward enough to realize that war is no longer a question of men and resources and money, but one of a vast, complex system of organization of shops and mills and *every* industry, of all skilled labor, of all executive intelligence, of all financial foresight and acumen. In short, war is a question of the ability to make use, effective use, of men and resources and money in the minimum of time.

The war in Europe had been under way for more than a year before some of the belligerent countries were able to equip their men who voluntarily offered their services; and from present indications it is hardly to be expected that our own country will be an exception in this respect. The Governments at war, especially on the side of the Allies, put forward their very best efforts, yet the mobilization of their industries lagged, due to lack of foresight.

We are being taught graphically, by moving pictures as it were, what war in all its phases means today, and how ill-prepared we are to meet this terrible stress. Of what use, indeed, are millions of men if they are untrained and uninstructed; of what use are guns, on land or sea, if we have not enough qualified machine shop capacity, and willing and patriotic operators, to supply ammunition needed; of what use are food-stuffs and clothing and supplies of all kinds if they cannot be purchased and delivered quickly to the armies and navies which need them; of what use is vast, national wealth if it cannot be used systematically and to the extent it becomes needed; of what use are great transportation systems without adequate rolling stock, proper terminal facilities or centralized executive direction?

Our situation could be compared with that of the sailor in a small boat in mid-ocean, surrounded by miles of water and not a drop to drink; or like the traveler in the desert who sees all the glory of the mirage without realizing it is only a picture of what might be.

We have a Herculean task before us, but it is being met as all great National crises in this country have been met in the past. Things at Washington are being shaped into form, as is evidenced by the appointment of the various Advisory Boards. And the patriotic responses to the call of duty on the part of our citizens accustomed to handling big affairs, and of the great captains of industry; the selection of many of our greatest and most successful Railroad Executives to act as a Central Executive Committee for the railroads, and the active use by the Federal authorities of the great Engineering and Scientific Societies of the country, insure a directing supervision of the highest degree; in fact, strongly indicate that we are becoming more cohesive and pulling together to an advantage that spells success, proving that, when we need to cope with the mechanisms of modern warfare, democracy can be depended upon to provide statesmen, and American genius to provide the inventions to meet the emergency.

Upon organization and intelligent leadership must be based the effective mobilization of all our resources, in men and materials, for, as Kipling so tersely stated:

"It ain't the guns nor armament, nor funds that they can pay
But the close co-operation that makes them win the day;
It ain't the individual, nor the army as a whole,
But the everlastin' teamwork of every bloomin' soul."

Most of you, no doubt, are aware of the large munitions' contracts taken by many concerns in this country for the manufacture of ammunition for the Allies before the advent of our own country into the war. These contracts were mostly taken by large manufacturing concerns or by a combination of manufacturers. The combination of which the Company I have the privilege of representing, undertook to manufacture shrapnel and high explosive shells in complete units, the value of the order aggregating approximately $100,000,000. After the order was executed it was necessary to construct new buildings and purchase materials, machinery and supplies of all kinds before the actual work of manufacturing could begin.

I am sure you will be amazed when I tell you that not one of the Companies comprising the combination referred to was able to obtain a single expert, or employee, with but one exception, who had ever worked in an ammunition factory of any description. All of the Companies referred to had, of course, high-grade organizations for the manufacture of their regular product; but, with the exception of the one man referred to, there was no person in any of the organizations, from the Presidents down to the lowest workmen, who had the least conception of the manufacture of projectiles. I am sure you will appreciate, also, what the present value of this training is to manufacturers who are now undertaking to execute ammunition contracts for our own Government.

On May 31st, 1916, I was privileged to read a paper in Carnegie Music Hall, before the Engineers' Society of Western Pennsylvania, on the subject of "Mobilization of Material and Industrial Resources," at which time I stated that "one of the greatest national services that could be rendered by the manufacturers now engaged in the production of ammunition for foreign countries and who, at great expense, have mastered the intricacies of the art, would be to impart the information so gained to managers of other plants that are likely to be enrolled in a general preparedness scheme. When organizing for the task assumed by the companies I have referred to, it would have been a great advantage if the plants which had previously engaged and become proficient in work of this character had given freely of their knowledge. I regret to say, however, that there was a disposition on the part of some manufacturers to be secretive, notwithstanding they could have supplied valuable assistance without monetary loss or violation of any business ethics. The volume of European orders at that time exceeded the capacity of the available manufacturing plants, yet the manufacturers in question absolutely refused to divulge any helpful information, even though one may have been a customer of the other along ordinary commercial lines, and the mutual relationship had been most cordial. It is needless to say that this narrow-minded and selfish attitude cost enormous sums of money and much valuable time. Contrast this attitude with that maintained by our brother manufacturers in the Dominion of Canada. The ammunition plants there threw their doors wide open, and those United States manufacturers who sought information not only had their requests gratified, but knowledge was gladly and liberally imparted in every instance."

To better illustrate the enormity of the undertaking, it might be well to here enumerate the amount of raw material necessary to manufacture and complete the ammunition contracts taken by the Westinghouse interests in the Turtle Creek Valley:

Steel Forgings, 13 900 carloads.
Copper for Bands, 750 carloads.
Rope to Protect Copper Bands, 1,440 miles.
Varnish and Paint, 375 barrels.
Lumber for Shipping Boxes, 31,623,216 feet, 1,074 carloads.
Brass Discs for Cartridge Cases, 124 carloads.
Antimony for Bullets, 1,300,000 pounds, 26 carloads.
Lead for Bullets, 8,968,750 pounds, 179 carloads.
Half-inch Bullets, 327 per shell, 409,000,000 to load 1,250,000 18-pound shrapnel.
Rosin to Hold Bullets in Solid Mass, 4,320 barrels, 43 carloads.

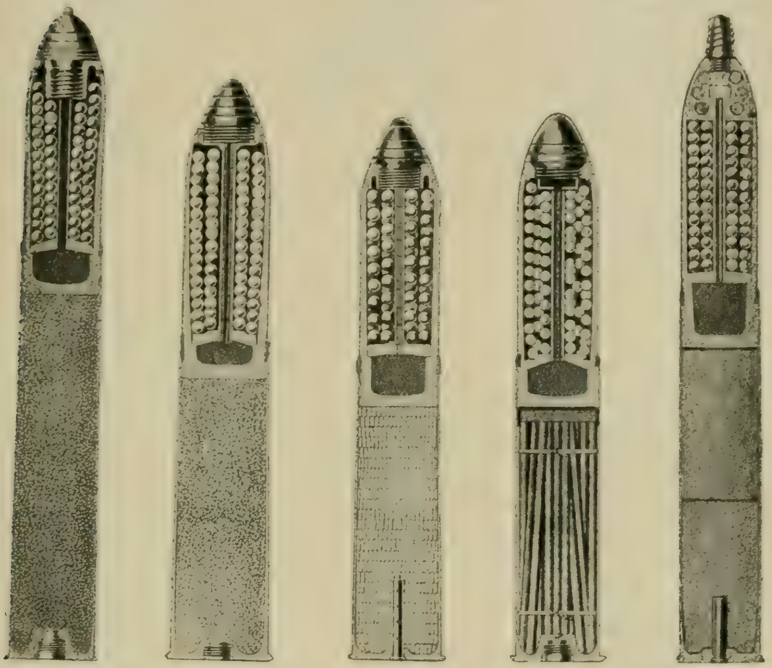
To ship the completed product required a total of 14,150 cars, which, if coupled in one solid train, would have made a train over 100 miles long.

In organizing for the manufacture of ammunition there will be many features, such as specifications, materials, designing, limits of tolerances, gages, tools, inspection, etc., to be provided for. Special attention and careful study should be given to the specification, and experts provided to give such attention to the specifications for all raw materials. Many vague points, which had to be cleared up before production could be safely started, were found in the specifications submitted with ammunition orders from foreign countries.

The nature of the materials specified is of vital importance for a number of reasons. First, the market or the availability of a material must be considered. The ideal condition is a market sufficiently broad and flexible that a sudden increase in the demand for the material of 10, 20 or 100 times the normal requirements will not send the price to a prohibitive figure. Take, for instance, the behavior of the market for ferro-manganese during the year May, 1915 to May, 1916. The price advanced from $40 to $1,000 per ton during that time, which indicates that a large portion of the ferro-manganese we use must be imported. In this case the question resolves to this: Can we make suitable projectiles with a lower manganese content; can we develop within our own borders manganese ore to provide the necessary supply; or can we find some substitute to give equally satisfactory results?

During our experience in the manufacture of shrapnel for the Allies we picked up weak points which showed that the factor of quantity of available materials had not been duly considered. As an example, a certain specification received from one of the Allies called for a quantity of magnesium powder to be used in the shrapnel shell. It was found that there was not available in the United States more than a quarter of the magnesium powder required to supply this demand. After some months of negotiation and delay, the Government interested agreed to a substitute for the magnesium powder specified. This made the specifications similar in this regard to those of other European countries.

A hard and unyielding market for a material requires that the question of some adequate substitute be investigated thoroughly and that the governmental specifications, through staff approval, be made sufficiently adaptable to accommodate practicable substitutions. This feature was particularly lacking in the first specifications submitted by foreign governments for the manufacture of munitions in this country.



Russian Shrapnel 3-inch

British 18-lb. Shrapnel 3.29-inch

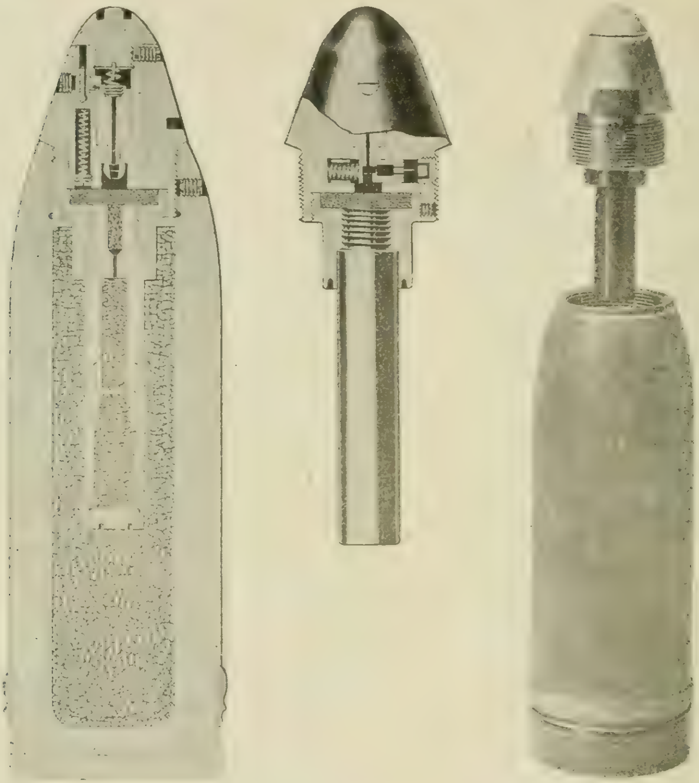
American Shrapnel 3-inch

German Shrapnel 77 mm 3.03-inch

French Shrapnel 75 mm 2.95-inch

Fig. 1. Various Types of Shrapnel Shell.

The nature of the materials specified is important for another reason. The chemical and physical properties are, of course, the final measure of a material's usefulness. But where these properties essential to the final service of the product are not sacrificed in any way, it is very necessary that the specifications be made to include materials that can be "worked" and machined readily in the shop. After selecting a material with the necessary physical properties for the service intended, the questions should be asked: How does it forge? How does it machine? How does it "work" in the shop? This means that the chemist and the engineer should co-operate with the shop end—the practical end—before a material is adopted for a given purpose.



Sectional View. Complete Unit.

FIG. 2. BRITISH 3-INCH HIGH-EXPLOSIVE SHELL WITH GRAZE FUSE.

In connection with specifications and with special reference to the quantity production of accurate work is the exceedingly vital question of the tolerances or limits of precision permitted in the size and weight of the finished article. The performance of munitions in the field must be the determining factor in this regard, and the enforcing of any accuracy in manufacture beyond that necessary to insure the proper performance on the firing line can do no more than curtail production and greatly add to its cost. As the precision limits are widened production is increased in much greater proportion. For instance: an allow-

DIAMETER $3\frac{3}{8}$″ INCHES.
MUZZLE VELOCITY 1,800 FT. PER SEC
AVERAGE STRIKING VELOCITY OF BULLETS AFTER SHELL
EXPLODES AT MAXIMUM RANGE - 1000 FT PER SEC.
MAXIMUM RANGE 6,500 YDS. (3.7 MILES.)
MAXIMUM DURATION OF FLIGHT - 22 SEC

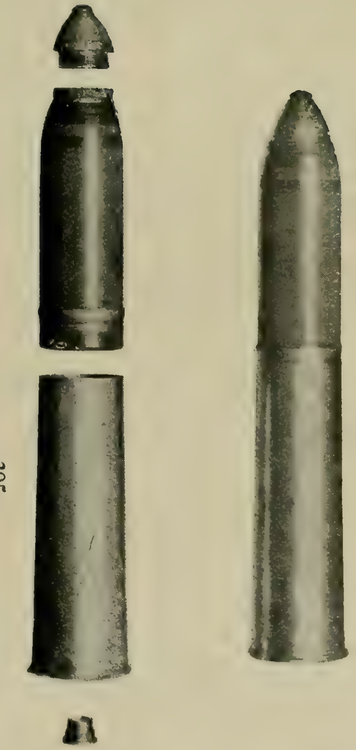


Fig. 3. Complete Unit

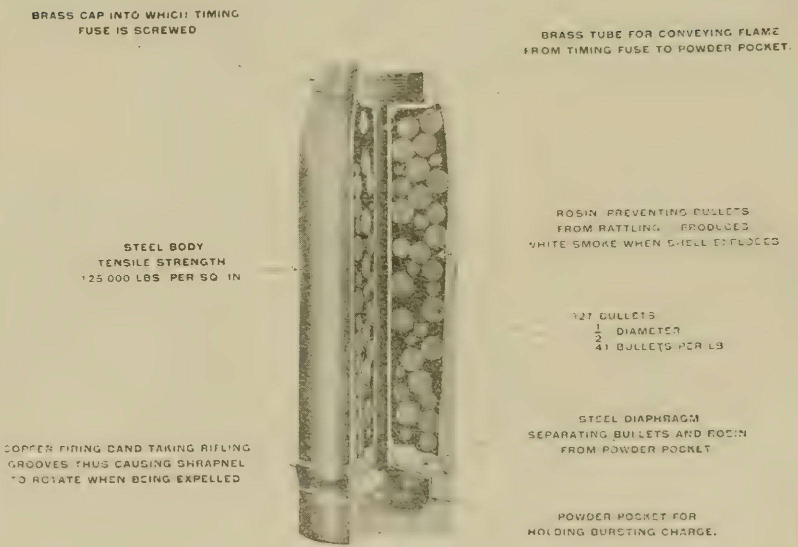

BRASS CAP INTO WHICH TIMING FUSE IS SCREWED
STEEL BODY TENSILE STRENGTH 125 000 LBS PER SQ IN
COPPER FIRING BAND TAKING RIFLING GROOVES THUS CAUSING SHRAPNEL TO ROTATE WHEN BEING EXPELLED
BRASS TUBE FOR CONVEYING FLAME FROM TIMING FUSE TO POWDER POCKET.
ROSIN PREVENTING BULLETS FROM RATTLING PRODUCES WHITE SMOKE WHEN SHELL EXPLODES
127 BULLETS
½ DIAMETER
41 BULLETS PER LB
STEEL DIAPHRAGM SEPARATING BULLETS AND ROSIN FROM POWDER POCKET
POWDER POCKET FOR HOLDING BURSTING CHARGE.

Fig. 4. Section of Shell.

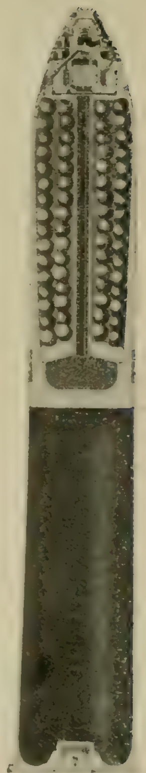


Fig. 5. Section of Complete Unit.

British 18-Pound Shrapnel.

ance of plus or minus fifteen-thousandths of an inch for a certain thread in the manufacture of shrapnel requires that a new tap be employed after a certain number of pieces have been finished. If the allowance be increased 100% about twenty times the number of threads can be finished per tap. And similarly about ten times the number of threads can be gaged with this increased allowance before a new gage is needed for the job.

The colossal rate at which ammunition is being fired away on the European battle-fronts bespeaks the great emphasis which is being placed on *capacity* at the expense of efficiency. That is, were the rate of firing reduced, the *percentage* of telling blows, as compared with the total number of shots, would be increased greatly but the *absolute* number of such blows would be reduced.

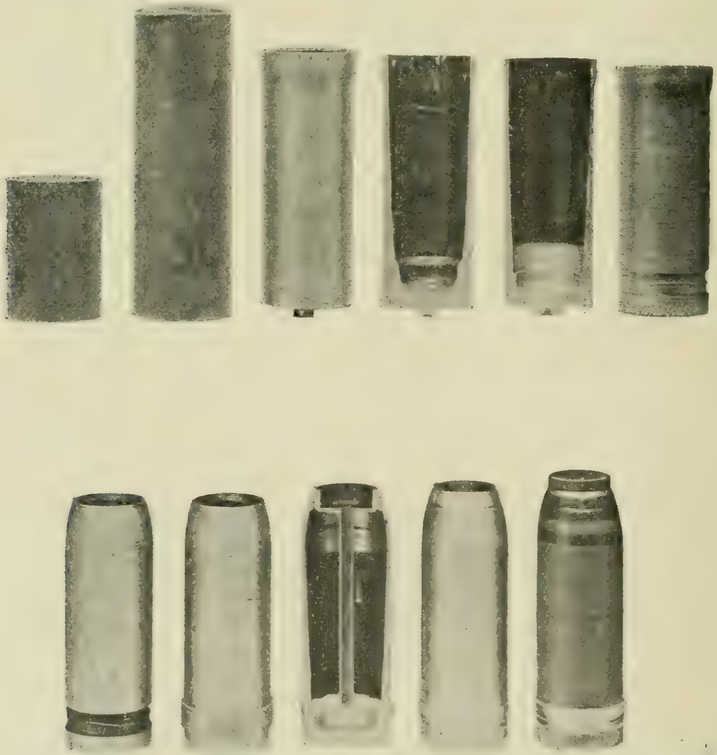


Fig. 6. Evolution of Steel Shrapnel Shell.

Efficiency is given up for the sake of capacity, and we recognize, of course, that this must be so. The example of the battle-front must be taken to the workshop. Limits of accuracy in manufacture must be no narrower for a product than is warranted by the performance desired for it in the field.

Following the study and revision of the specifications will come the planning and scheduling of every detail of the shop work. This should receive attention by the metallurgist and mechanical engineers and the shop Superintendent—these experts meeting in conference frequently to keep all phases of the work "lined up" while changes here and improvements there are effected.

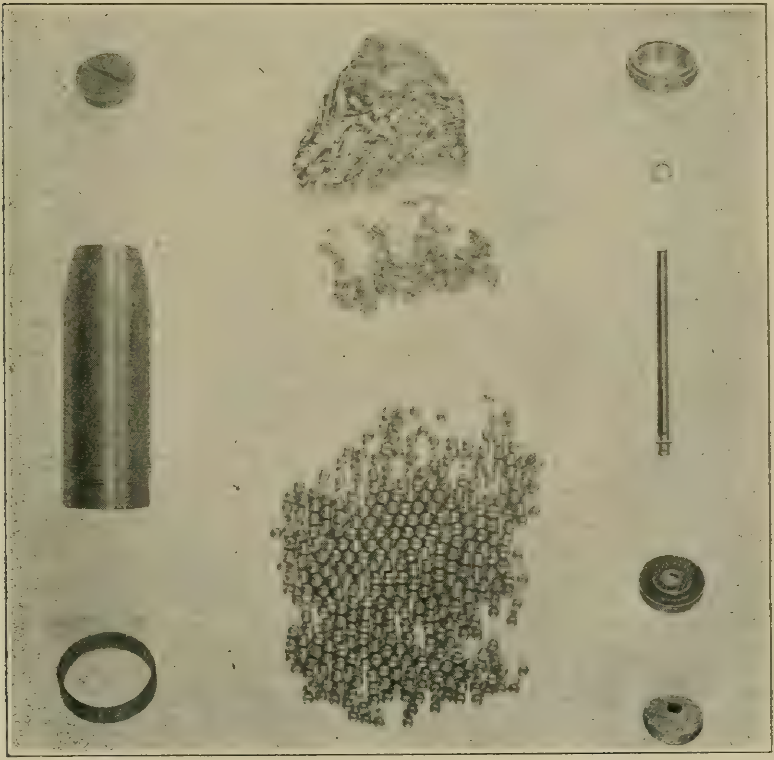


FIG. 7. DETAILS OF BRITISH 18-POUND SHRAPNEL.

The number of gages required in the successful quantity production of accurate work in the manufacture of ammunition is *enormous.* And to provide these gages, together with jigs, machine fixtures and other special tools, in the number they are needed is one of the greatest problems with which ammunition manufacturers have to cope.

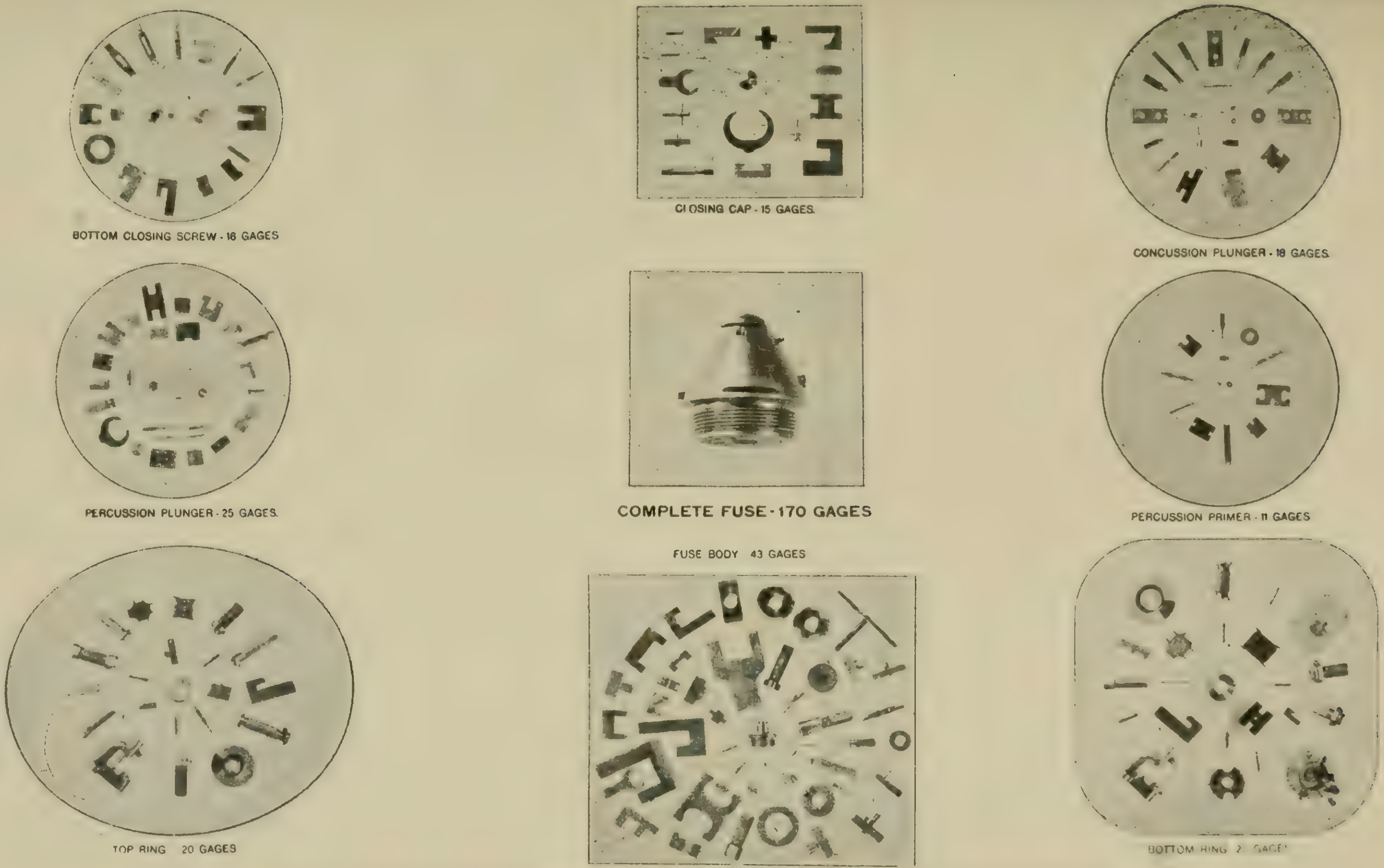
As an illustration, in the manufacture of the combination time and percussion fuse alone for 3¼-inch shrapnel, 170 gages are required to constitute one complete set. Seven sets for an output of 10,000 fuses per day make a total of 1,190 gages. A total of 243 separate operations with the above gages and 32 special fixtures and jigs are required to complete the details.

Undue stress cannot be placed on the need for having a well organized system of inspection to check, not only at the end, but at each successive stage, of manufacture, the chemical and physical properties of the product as well as the variations in dimension caused by the wear of tools, faulty workmanship, ill-suited material, etc. The personnel of the inspection force is of the utmost importance, for it is quite unwise to give the power of rejection to a group of uninformed inspectors who are lacking in judgment; and if power to reject be denied, the inspection force might well be dispensed with.

As just mentioned, successful large-scale manufacture will depend greatly upon careful checking of the physical and chemical characteristics of the product from step to step of its evolution as well as upon checking the dimensions and weight. The chemist and metallurgist is right in his element here. We had innumerable instances of trouble and its correction by the *detective* work of the chemist.

In our cartridge case work it was found especially necessary that a proper composition of brass be had in order that the metal draw properly. Every shipment of brass was tested chemically and physically as soon as it was received and before it was placed in the storeroom. And aside from the chemical composition it was necessary that the metal be free from cinder and other foreign matter. Often this dross or foreign matter would not appear until the final draw and at that time it would often condemn the piece. In tracing this trouble it was found to originate at the foundry of the supplying mill. The brass got through the rolls and all the draws and processes in our shop before the dross appeared as a serious defect.

In any inspection a fundamental rule may be laid down



BOTTOM CLOSING SCREW - 16 GAGES
CLOSING CAP - 15 GAGES
CONCUSSION PLUNGER - 18 GAGES
PERCUSSION PLUNGER - 25 GAGES
COMPLETE FUSE - 170 GAGES
PERCUSSION PRIMER - 11 GAGES
FUSE BODY 43 GAGES
TOP RING 20 GAGES
BOTTOM RING 2 GAGES

FIG. 8. ONE HUNDRED AND SEVENTY GAGES REQUIRED TO MANUFACTURE TIME FUSE.

that trouble must be caught at its inception, and for this reason it is essential to check the product at each stage in the manufacture. In other words, "a stitch in time saves nine."

We used a system of microscopic examination of cartridge cases between various shop operations.

For instance, we made a microscopic examination immediately after a certain draw and again after the case had been annealed to check on the heat treatment. A different heat treatment was found to be necessary after various operations because of the varying thickness of the metal. The structure of the metal at the open and closed ends of the cartridge case was different because of variation in thickness and variation in amount of drawing or working the metal had undergone. The metal could not be too hard in the finished case else it might crack while the shell was fired from the gun. It could not be too soft, for it then would bulge and stick in the gun. It is required that these cases be used eight or ten times in the gun before finally being scrapped, which places great importance on the physical and chemical composition.

FIG. 9. PYROMETER SWITCHBOARD.

In the manufacture of the steel shrapnel shell we instituted a method of heat treatment which, in my knowledge, is quite novel and unique. The novel features consisted largely in the construction of the heating furnace.

This furnace contained six tubes in a horizontal plane, each having a capacity of 19 shells. Depending upon the amount of carbon contained in the particular lot of shells the furnace temperature was maintained within 10 degrees of some point between 1550 degrees and 1600 degrees Fahr., and the shells permitted to remain for about fifty minutes.

The furnace temperature was constantly under careful and accurate control, being checked by a number of pyrometer connections to various parts of the furnace. (Fig. 9)

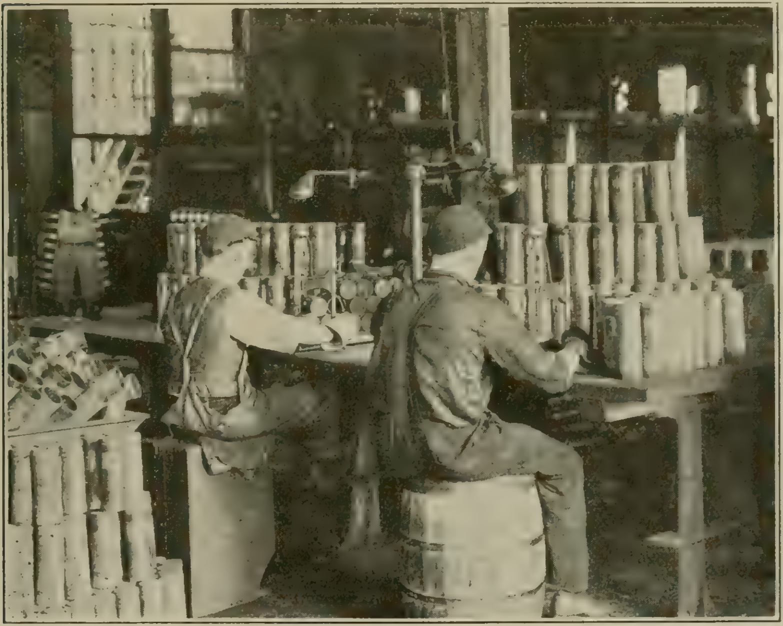


Fig. 10. Testing Each Shell With Schleroscope.

They were then shoved out and quenched in an oil bath, after which they were cleaned and tested for hardness by means of a schleroscope.

This method of heating and quenching excluded air and thereby reduced to a minimum any tendency to scale. The shells were then grouped according to hardness; group *a* containing all shells having a hardness below 40. Because the proper tensile strength could not be obtained in the shells of this group they were returned to the furnace for rehardening. Group *b* contained shells having a hardness of from 40 to 50; group *c* from 50 to 60; and group *d* all above 60. This variation in hardness, despite the uniformity of treatment, was due to slight variations in carbon content. This grouping was done to permit varying the tempering or drawing operation in order to bring the final shell hardness to a uniform and specified point.

The steel shells were placed in the drawing furnace for about 35 minutes, the furnace temperature being graded according to the group, thus: 900 degrees Fahr. for group *c*; and 1000 degrees Fahr. for group *d*. These shells were then cooled in the atmosphere.

For a while we got low readings for our hardness test after the shell had been quenched and we finally traced the trouble to the quenching oil. We found that pure mineral oil did not give the proper hardening effect and to overcome this we added 25 to 30 % whale oil which gave us good results thereafter.

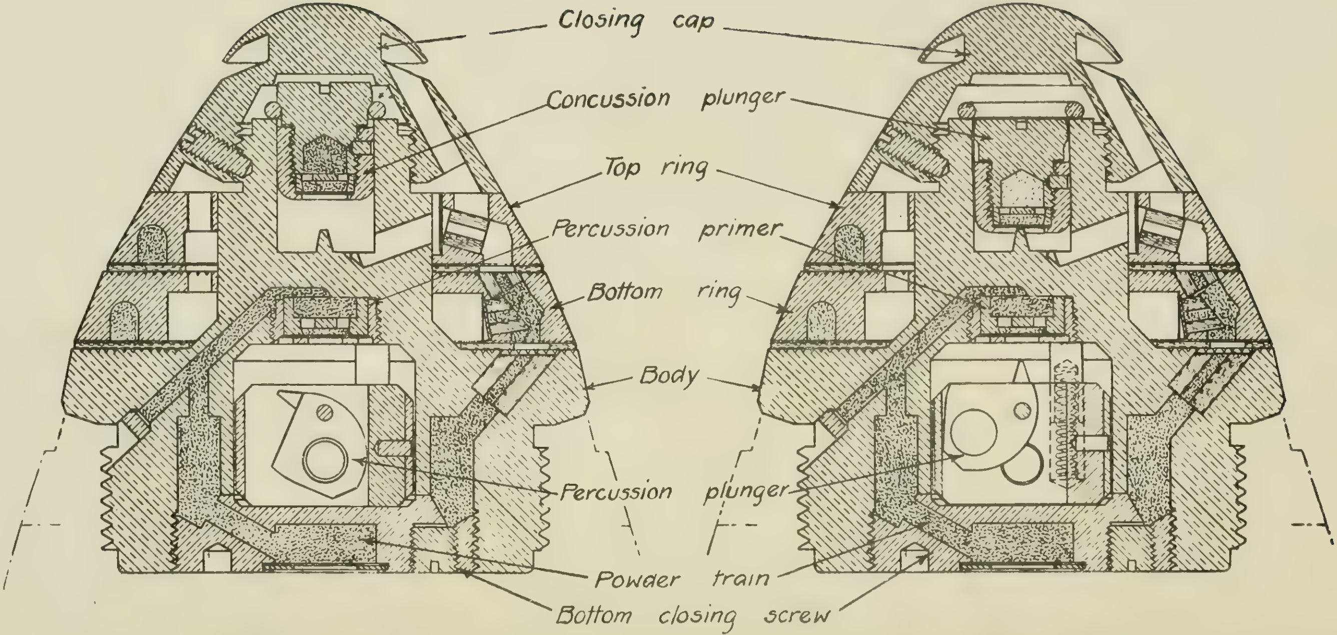
A number of brass parts for the shrapnel shell were machined from drop forgings, notably the timing fuse socket and the fuse body. Others were made from rolled brass. In the case of the latter it was often found that the quickest and best results were obtained where the chemist, in keeping close check on the work in the shop, co-operated with the mills supplying the material. Frequently, pieces would not hold to size; that is, unpermissible variations in size would ensue for a constant setting of tools and fixtures. This was traced to a too rapid reduction in the rolling processes at the mill, and also to a variation in composition. Thereafter no further trouble of this particular nature resulted.

The blanks, from which drop forgings of brass are made, are poured, and re-heated immediately before the forging operation. The co-operation of the chemist with the foundry will be found to be of great help in this connection. If in casting the blanks the brass is overheated the metal becomes brittle and, similarly, if overheated previous to forging or if the chemical composition be not correct the metal has a tendency to crumble in the forging operation. For a time we experienced some difficulty in keeping an edge on our tools while machining these forgings and traced the trouble to sand dropping down on the blanks from the walls in the furnace used for heating these blanks just before forging.

In the manufacture of the concussion plunger ring for the combination timing and percussion fuse, it was found that the operation of this ring depended as much upon the finish of the surfaces as upon the hardness and chemical composition of the metal. The method of testing this ring consisted in pulling a concussion plunger through it and noting the pull required—a test based directly upon service operation.

The combination timing and percussion fuse is one of the most difficult pieces to make in the wide range of ammunition manufacture and, correspondingly, the part with which more trouble was had recently in the widespread undertaking to supply foreign governments with ammunition. This difficulty arose in the intricacy and precision required in its makeup. For this reason it might be well to mention its construction and some of our experiences with it.

This timing fuse is made up as shown in Fig. 11. When expelled from the gun with the steel shrapnel shell to which it is attached, because of its inertia the concussion plunger tends to be left behind, spreads the safety ring which normally holds it in place, and strikes its primer on the sharp projection or firing pin at the bottom of its cylinder. This ignites the powder train, which is of a length varying with the setting of the graduating timing ring and requiring a corresponding time to burn down into the explosive charge contained in the bottom of the shrapnel shell, which in turn scatters the bullets with deadly effect. In case of a faulty setting, which exceeds the proper time for explosion, the fuse upon impact will explode the shrapnel by virtue of the auxiliary percussion parts. The percussion firing pin is held in a withdrawn or safety position by means of two pins in order that unduly rough handling may not cause a premature explosion, as shown in the section on the left. Upon being fired from the gun the rotation of the shell, due to engagement of the copper band with the spiral grooves, causes these safety pins to fly out of engagement and centrifugal force likewise throws the firing pin into the position shown in the view on the right. Upon



BEFORE FIRING

AFTER FIRING

FIG. 11. BRITISH COMBINATION TIMING AND PERCUSSION FUSE.

impact the percussion plunger is thrown forward, causing the firing pin to strike the primer and start the powder train by a direct route into the shrapnel, giving thereby an immediate explosion.

Great precision is demanded in the manufacture of this fuse. Take, for example, the vents for the gases from the burning powder, which are seen in the closing cap and to the left of each section. An apparently insignificant variation in this opening so affects the burning time of the powder that the fuse cannot pass the required test. The influence of variation in the dimensions of the various ports and passageways containing the powder is more apparent. The following is an extract from the specifications governing the behavior of this fuse:

> "Five fuses from a lot (2000 in a lot) will be tested, in shrapnel shells, by firing them set at "O" from a gun with a muzzle velocity of 1500 to 1800 feet per second. The fuses should burst the shells at from 5 to 50 yards from the muzzle of the gun. Should there be a burst in the gun, the lot will be rejected. Should any fuse fail to act within 50 yards, second proof will be taken; should a similar failure occur in the second proof, or should there be more than one such failure at the first proof, the lot will be rejected."

The time limits this test imposes are from one-hundredth (.01) to eighty-three thousandths (.083) second, or a range of seventy-three thousandths (.073) of a second. This exceedingly small margin requires that most careful and scientific attention be given to dimensions, quality of metal, quality of powder, air conditioning of the plant to hold the moisture content of the powder within very narrow limits, etc., if successful manufacture on a large scale is to be possible. It also bespeaks ample latitude where such can be given as there is plenty of the intricate with which to contend.

You may be interested to know that at our plant, which completed a contract for 1,250,000 shrapnel shells, not a single lot was rejected, and in only two cases were shells required for second proof firing to check the first. This pertains to the entire shell, fuse and steel shell combined.

At this juncture it will not be amiss to recite in some detail

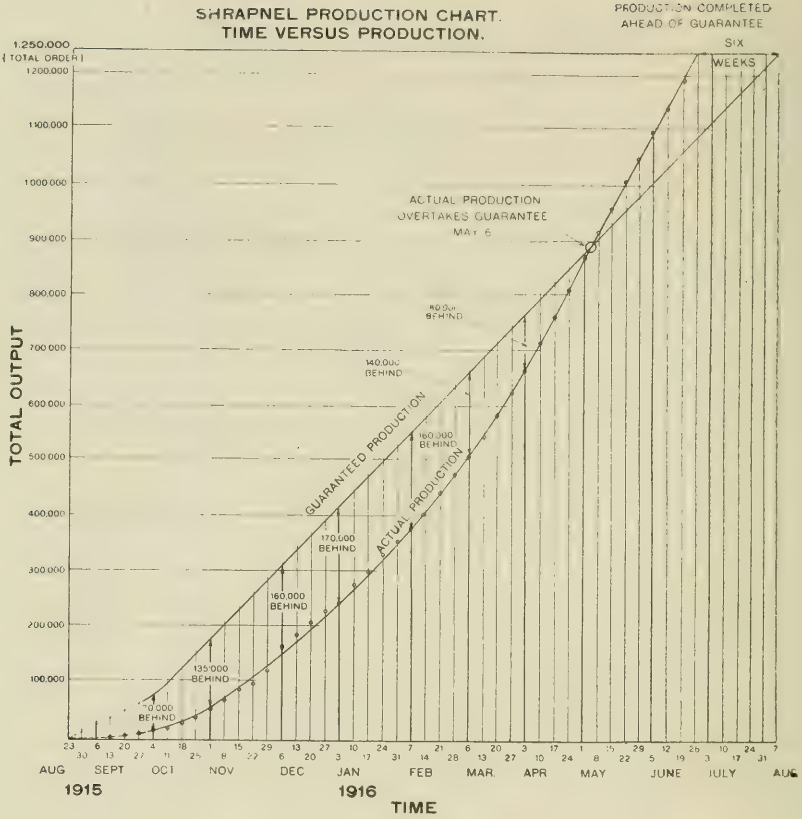


FIG. 12

the problems that confronted us in loading time fuses, of which we manufactured over 3,000,000.

The burning time of the fuse is governed by the accuracy of the parts, by the burning time of the powder in the rings, and by the time of igniting this powder through the medium of the powder pellets. This powder, by the way, is pressed into the fuse grooves with a pressure of 68,000 pounds per square inch. The ignition of the powder is accomplished by the use of powder pellets, which must be uniform, because pellets of varying texture take different times to ignite, and may introduce at this point a variable in the operation of the fuse. The ignition of the pellet is accomplished by guncotton. The use of guncotton in the pellet may also introduce a variable. For example: if cotton is placed in the pellet too tight, it prevents firing from the primer and interferes with the ignition of the pellet.

The burning time of the powder can only be determined by loading fuses with the powder as it is received from the powder manufacturer. The powder came in lots of 240 pounds and each lot had a different burning time. Very few lots as they were received were correct for time. After determining the time of each lot it was necessary to blend the lots together so as to give the correct uniformity in time for burning.

As a general rule, all materials entering into an assembly plant should be proved correct before coming to the plant. This is especially true of powder, and the powder manufacturers should be in a position to guarantee their product as suitable for use before they ship it. There is no reason why this should not be done except for the one of expense. The expense, however, would be less at the powder factory than at the fuse plant. and would avoid serious delays in making the fuses.

The standardization of a timing apparatus for burning fuses at rest would be of great help to the fuse manufacturers. The very best apparatus which could be obtained upon starting this work was so slow that it took 1½ hours to determine the time for 10 fuses; but since then we developed a timing apparatus which gives this time in 5 minutes. This saving of time was of vital importance, as 1000 fuses were often fired in order to get the time of one shipment of powder and test out the blends before it was deemed safe to use it for regular production. Standard methods for blending meal powder should also be determined by the Government. It was found that 16 hours were required to blend powder by the tumbling barrel method. which we understood was the accepted way of doing this work. but by designing special machinery we were able to get a slightly better result in 15 minutes. This saving of time also proved of decided advantage in fuse plants.

In preparing powder it was found necessary to be very uniform in methods. Factory operations were scheduled three days ahead and powder was blended one day which would be used two days after. After blending, the powder was spread on trays and put in the dry room for 24 hours. If operations were interrupted the attempt was not made to use powder that was left over from previous days, but the powder was used which had been prepared specially for that day. Powder, being hydroscopic, was blended and loaded under special air conditions—the blending rooms and loading rooms were maintained constantly at a temperature of 70 degrees and relative humidity of 45 per cent; the drying-room was maintained at a temperature of 90 degrees and a relative humidity of 23 per cent.

A list was made of all the lots of each shipment, showing number of shipment, lot number, pounds in each lot and average mean burning time, arranged in the order of the burning time, beginning with the slowest burning lot and finishing with the fastest. It is obvious that a clear record of the burning time of all the fuse powder in the magazines was on file all the while.

It was due to the fact that powder mills were not able to control the burning time of powder to an accurate degree, and also to the benefit derived from having a large amount of powder of just the right burning time, that the blending of powder was employed. The theoretical burning time at rest of a fuse with a burning time of 21 seconds in the gun was 22.9 seconds. This time varied considerably with the different makes of fuses and had to be determined by test and observation. Once the burning fuse at rest was established, it remained a simple problem of calculation to obtain the proper mixture, by using such lots of which the arithmetical mean of their burning times corresponded with the desired time.

In making up the "Blending Schedule," it was found advisable to arrange the powder lots into groups of such numbers which would conform to the full capacity of the blending machine; that is, the number of cans the blending machine was capable of holding at one time.

Assuming this number to be nine, the powder lots were arranged in groups of nine, the arithmetical mean burning time of each group being the same or near the same as the desired burning time. Blending these groups together, in turn, a large blend of powder of the desired burning time was the result.

Having made the Blending Schedule, one batch of this blend was run through the machine and a sample taken, dried, loaded fuses assembled and fired, and in this way the actual time of the blend was ascertained. If satisfactory, the blending proceeded; if not, changes were made in the schedule and more slow or fast powder was either added or omitted, according to circumstances, until the desired burning time was reached. In the last analysis the blending of powder is largely a matter of trial—the method of arithmetical means of burning times being very uncertain in its results, though the best approximation possible before applying the process of "cut and try."

In closing, it can be stated as a general proposition that at every step in the progress from raw material to the finished product, the co-operation of the chemist, the metallurgist and the engineer and the man behind the gun, the practical man, is indispensable to modern manufacture, not only in the realm of munition-making but in every industry in the land.

Therefore, let *every* man become a citizen for service to his country, be that service hard or easy, in order that in this world's conflict our country may lead in national efficiency, pride and greatness. Let us teach, therefore, economy in natural resources. Let us strive for perfection in useful arts and science; let us teach dignity of labor, rights of capital and the folly of internal dissensions and struggles which only waste and weaken; let us teach intelligence and sound judgment to all the people, and then will the Nation realize that great resources do not necessarily mean strength, but only when the whole process of bringing these resources to utility has been evolved and put into operation.

DISCUSSION

MR. FRANK J. LANAHAN: Mr. President, it certainly has been a rare privilege for this organization to have presented to it, such an able paper in such a masterly manner, and by one fully capable of handling the subject. We all realize that perfection is made up of trifles, but that perfection itself is no trifle. The number of operations that we have been privileged to witness as despict on the screen, and hear them described in the clear and intelligent presentation of the speaker, must bring home to us appreciation of American genius. Further, we cannot help feeling that our soldiers going to the front will be well protected as long as we are supplied with the able minds and executive ability, such as we had a glimpse of tonight.

In connection with what Mr. Humphrey brought out as to the almost limitless operations necessary for the furnishing a modern army with muntions, I had the privilege of hearing Lord Northcliffe speak on this same subject at the United States Chamber of Commerce War Convention at Atlantic City last week. In conveying an idea of the magnitude with which these operations are carried on in Europe, he mentioned that at Bowling Green on the border of England and Scotland, the British government has one ammunition factory nine miles long and three miles wide. There are innumerable other plants scattered throughout the country, but this is the largest single factory. Many goodly sized ammunition plants are now located in the various war zones, as the demands for shells is so great and the risk of delay so perilous, that no chances are taken in the way of interruption of artillery fire that would be so dire in its consequence. This information to me was most surprising and pertinent, for as a nation, WE MUST WAKE UP. We need the stirring influence of a speech such as we have listened to tonight to bring us to a true realization of our position in this great world war, and the responsibilities we have assumed. Especially commendable are the patriotic allusions of Mr. Humphrey to the loyal workers valiantly doing their service for the country in industrial organizations. This is something we can all take to heart and carry home with us to make us better for having heard this trueism. Mr. Humphrey's suggestions in this line can be expressed in a single word "co-operation" but it means co-operation in every way. It is not alone the soldiers in the trenches—risking their lives—nor their equally daring brothers with the artillery behind the line, that are entitled to the sole credit for their patriotism; a share must be given to the brave soldiers at home that have joined themselves to industrial activities, that by constant toil and strenuous efforts, may keep the army supplied with ammunition and other necessities. We have been told in the early part of the war, England had to bring back from the front, five out of every six soldiers that had rushed to the battlefield at the first call to arms. These recruits were absolutely needed to maintain industrial pursuits. In this country fortunately we can profit by the mistakes of our ally, and it is a wise percaution that the government has taken in this direction.

And may I bespeak on behalf of those who are at home—the credit due them for the service they are rendering. In no way do I wish to diminish the praise due those brave soldiers who have gone to the front. Justly are they entitled to fullsome honor, but a proportionate amount of credit should be extended to the mechanics and artisans whose services are just as necessary and needed every bit as much as their brothers on the firing line.

Mr. President, I move that a rising vote of thanks be given to Mr. Humphrey for his intellectual treat upon this live topic of the hour, but particularly for the spirit of patriotism that he has shown to the members of the Club tonight.

This MOTION was duly seconded and unanimously carried.

There being no further business, on MOTION adjourned.

J. B. Anderson
Secretary.

RAILWAY CLUB NOTES.

The following subjects were presented and discussed by the several Railway Clubs during the month of September, 1917, as noted below:

New York Railroad Club, Harry D. Vought, Secretary,
95 Liberty Street, New York, N. Y.

SUBJECT—"Electric Arc Welding in Railroad Shops by *Charles H. Florandin.*

New England Railroad Club, Wm. E. Cade, Jr., Secretary,
683 Atlantic Avenue, Boston, Mass.

SUBJECT—Unknown.

Canadian Railway Club, James Powell, Secretary,
P. O. Box 7, St. Lambert, near Montreal, Can.

SUBJECT—"Some Present Day Problems in Railway Maintenance Work" by *F. B. Tapley.*

Richmond Railway Club, F. O. Robinson, Secretary,
Richmond, Va.

SUBJECT—Unknown.

St. Louis Railway Club, B. W. Frauenthal, Secretary,
Union Station, St. Louis, Mo.

SUBJECT—"What the Railroads Are Doing to Win the War" by *Richard H. Aishton.*

Southern & Southwestern Ry. Club, A. J. Merrill, Secretary,
Box 1205, Atlanta, Ga.

SUBJECT—Unknown.

Central Railway Club, Buffalo, N. Y., Harry D. Vought,
Secretary, 95 Liberty Street, New York, N. Y.

SUBJECT—"The Relation of Air Compressor Capacity to Brake Pipe Leakage" by *C. H. Weaver.*

The Railway Club of Pittsburgh, J. B. Anderson, Secretary,
207 Penna. Station, Pittsburgh, Pa.

SUBJECT—"Ammunition Problems in War Time" by *A. L. Humphrey.*

Copies of the above papers can be had upon application to the Secretary at the address given for a nominal price.

INDEX OF PAPERS AND THEIR AUTHORS

Presented Before Railway Clubs During Season of 1916-1917

Compiled by the Society of Railway Club Secretaries

NEW YORK RAILROAD CLUB

Harry D. Vought, 95 Liberty Street, New York City
Secretary

September 15, 1916—"The Construction of the New Subways for New York City." By *Mr. Robert H. Jacobs, Senior Asst. Division Engineer, Public Service Commission for the First District.*

October 20, 1916—"The Training of Young Men for Positions of Responsibility." By *Mr. F. W. Thomas, of Topeka, Kan., Supervisor of Apprentices, A. T. & S. F. Railway.*

November 17, 1916—"The Water Power of Canada." By *Mr. L. O. Armstrong.*

December 15, 1916—Christmas Smoker.

January 18, 1917—"Accident Prevention." By *Mr. Marcus A. Dow, General Safety Agent, New York Central Lines.*

February 16, 1917—"The Locomotive Furnace." By *Mr. J. T. Anthony, Assistant to the President American Arch Co.*

March 16, 1917—"Operating Results from the Trunk Line Electrification of the Chicago, Milwaukee & St. Paul Railway." By *Mr. R. Beeuwkes, Electrical Engineer, Chicago, Milwaukee & St. Paul Railway.*

March 16, 1917—"Electrification of the Norfolk & Western Railway Company." By *Mr. C. H. Quinn, Chief Electrical Engineer.*

April 20, 1917—"Railway Water Supply." By *Mr. C. R. Knowles, Superintendent, Water Service, Illinois Central Railroad.*

May 18, 1917—"From Ore to Finished 'National' Pipe." By *Mr. N. C. Nicol, of the Metallurgical Department of the National Tube Company.*

CENTRAL RAILWAY CLUB

Harry D. Vought, 95 Liberty Street, New York City
Secretary-Treasurer

October 17, 1916—"Train Rules and Train Dispatching, Past and Present." By *Mr. John F. Mackie, Secretary-Editor, Train Dispatchers Association of America.*

November 10, 1916—"Fuel Economy and Proper Drafting of Locomotives." By *Mr. D. R. MacBain, S. M. P., New York Central Railroad.*

January 12, 1917.—"The Selection and Training of Car Inspectors." By *Mr. Hiram W. Belnap, Chief of the Division of Safety, Interstate Commerce Commission.*

March 8, 1917—"Annual Report of Standing Committee on M. C. B. Rules of Interchange."

May 11, 1917—"The Lubrication of Freight Cars in Interchange." By *Mr. T. J. Burns, S. R. S., Michigan Central Railroad.*

ST. LOUIS RAILWAY CLUB

B. W. Frauenthal, Union Station, St. Louis, Mo.
Secretary-Treasurer

May 12, 1916—"The Public Carrier and the Wage Scale." By *Hon. Charles Nagel, St. Louis, Missouri.* "Recent Progress in Testing Woods Used by the Railroads." By *Mr. Howard F. Weiss, Director, Forest Products Laboratory, Madison, Wisconsin.*

June 9, 1916—"Better Flagging." By *Mr. Grant Selby, St. Louis, Missouri.*

July 14, 1916—"The Railroad Problem in City Planning for St. Louis." By *Mr. Walter B. Stevens, Secretary, City Plan Commission, St. Louis, Mo.*

August 11, 1916—"The Railroad Superintendent." By *Mr. C. H. Markham, President, Illinois Central R. R., Chicago, Ill.*

September 8, 1916—"The Eight-Hour Law." By *Mr. B. F. Bush, Receiver, Missouri Pacific R. R., St. Louis, Mo.* "Efficiency of Railway Service in the United States." By *Mr. Arthur W. Thompson, Vice-President, The Baltimore & Ohio R. R., Baltimore, Md.*

October 13, 1916—"The Ubiquitous Freight Car Question and its Elusive Answer." By *Mr. E. H. DeGroot, Jr., Supt. of Transportation, Chicago & Eastern Illinois R. R., Chicago, Illinois.*

November 1, 1916—"Mechanical Firing of Locomotives." By *Mr. W. S. Bartholomew, President, Locomotive Stoker Co., Pittsburgh, Pa.*

December 8, 1916—"How Railroads' Dividends May be Increased." By *Dr. A. Ross Hill, President, University of Missouri, Columbia, Mo.* Christmas Entertainment.

January 12, 1917—"Electrification of Steam Railroads." By *Mr. William T. Whalen, Special Representative, Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa.*

February 9, 1917—"The Locomotive Inspection Laws and Rules: Their Purposes and Achievements." By *Mr. Frank McManamy, Chief Inspector, Division of Locomotive Inspection of the Interstate Commerce Commission, Washington, D. C.*

March 9, 1917—"From Tree to Track." By *Mr. J. H. Waterman, Supt. Timber Preservation, C. B. & Q. R. R., Galesburg, Ill.*

April 13, 1917—"The Freight Car Situation and its Probable Solution." By *Mr. J. A. Somerville, General Supt. of Transportation, The Missouri Pacific Ry., St. Louis, Mo.*

May 11, 1917—"Safety Appliance Standards." By *Mr. Hirman W. Belnap, Chief of the Division of Safety, Interstate Commerce Commission, Washington, D. C.*

NEW ENGLAND RAILROAD CLUB

William E. Cade, Jr., 683 Atlantic Avenue, Boston, Mass. Secretary

October 10, 1916—"Fuel Economy and Boiler Design." By *Mr. J. T. Anthony, Asst. to the President, American Arch Co., of New York.*

November 23, 1916—"King of the Rails." By *Mr. George H. Hill, Asst. Chief Engineer of the General Electric Co.*

December 12, 1916—"Railway Signalling." By *Mr. C. E. Denney, Special Engineer, New York, Chicago & St. Louis R. R.*

January 9, 1917—"Maintenance of Air Brakes on Freight Car Equipment." By *Mr. H. S. Walton, Supervisor Air Brakes, Boston & Albany R. R.*

February 13, 1917—"Historical Review of Steam Railway Electrification." By *Mr. W. R. Stinemetz of the Westinghouse Electric & Manufacturing Co.*

March 13, 1917—"Annual Meeting, Entertainment and Election of Officers and Reports."

April 10, 1917—"Stephenson and Transportation." By *Mr. F. E. Stanley, President of the Stanley Motor Carriage Co.*

May 8, 1917—"Duties of Civilians in War Time." By *Mr. Chas. F. Weed, President of the Boston Chamber of Commerce.*

CANADIAN CLUB

James Powell, Box 7, St. Lambert, near Montreal, Secretary

May 9, 1916—Annual Meeting and Election of Officers.

September 12, 1916—"Railway Scrap or Salvage." By *Mr. E. J. McVeigh, General Storekeeper, Grand Trunk Railway, Montreal.*

October 10, 1916—"Railway Publicity." By *Mr. Walter S. Thompson, Press Bureau, Grand Trunk Railway, Montreal.*

November 14, 1916—"Pulverized Fuel for Locomotives." By *Mr. Joel S. Coffin, Jr., Canadian Sales Manager, Locomotive Pulverized Fuel Co.*

December 12, 1916—"Notes on Heavy Electric Traction." By *Mr. J. A. Shaw, General Electrical Engineer, Canadian Pacific Railway, Montreal.*

January 9, 1917—"Passenger Car Painting." By *Mr. Thomas Marshall, Foreman Painter, Canadian Pacific Railway, Montreal.*

February 13, 1917—"The Chilled Iron Car Wheel." By *Mr. George W. Lyndon, President, Association of Manufacturers of Chilled Car Wheels, Chicago, Ill.*

March 13, 1917—Further discussion on "The Chilled Iron Car Wheel." By *Mr. George W. Lyndon, President, Association of Manufacturers of Chilled Car Wheels, Chicago, Ill.,* also paper on "Railways and Refractories." By *Mr. J. D. Ramsay, President and General Manager, Elk Firebrick Company, St. Marys, Pa.*

April 10, 1917—"Railway Operating Efficiency as Influenced by Material and Supply Accounts." By *Mr. W. E. Symons, Asst. to the President, Wilson, Welder & Metals Company, New York.*

THE RAILWAY CLUB OF PITTSBURGH

J. B. Anderson, 207 Penna. Station, Pittsburgh, Pa.
Secretary

September 22, 1916—"Railway Clubs and their Facilities for the Development of Young Men." By *Mr. G. M. Basford.*

October 27, 1916—"Annual Meeting, Election of Officers, Smoker-Vaudeville."

November 24, 1916—"Observations-Operation of Transportation Facilities and Manufacturing Activities in the Verdun Region." By *Mr. John A. Penton.*

December 18, 1916—"Freak Patents." By *Mr. Walter V. Turner.*

January 26, 1917—"The Man Problem." By *Mr. D. C. Buell.*

February 23, 1917—"The Effect of Fire-Box Design upon Boiler Capacity and Economy." By *Mr. J. T. Anthony.*

March 23, 1917—"Red Cross Organization." "Report of Revision of M. C. B. Rules." "The Telautograph." "What is Law?"

April 27, 1917—"Wanted—A Freight Car." By *Mr. A. M. Schoyer.*

May 25, 1917—"A Survey of the Mechanics of the Chilled Iron Car Wheel." By *Mr. George W. Lyndon.*

RICHMOND RAILROAD CLUB

F. O. Robinson, Eighth and Main Streets, Richmond, Va.
Secretary-Treasurer

September 11, 1916—"Notes on the Construction of the Subaqueous Tunnel of the Hudson & Manhattan R. R. By *Mr. Thomas G. Anthony, New York City.*

October 16, 1916—"Fire-box Efficiency." By *Mr. J. T. Anthony of New York City.*

November 13, 1916—Election of Officers. "War Conditions in Europe." By *Mr. Henry W. Anderson, Richmond, Va.*

December 11, 1916—"Projected Light in Railway Service." By *Mr. L. C. Porter, of the General Electric Co.*

January 19, 1917—"Travelogue on Glacier National Park." By *Mr. Laurence D. Kitchell.*

February 12, 1917—"The Valuation of Common Carriers." By *Mr. James P. Nelson, of the C. & O. Railway.*

March 12, 1917.—Nothing.

April 9, 1917—"Illustrated Lecture on London." By *Mr. A. B. Clarke, Richmond, Va.*

May 13, 1917—"Travelogue on Korea." By *Admiral Harrie Webster.*

SOUTHERN AND SOUTHWESTERN CLUB

A. J. Merrill, P. O. Box 1205, Atlanta, Ga., Secretary

November 16, 1916—"Fire Prevention and Fire Protection." By *Mr. John Hyland.*

January 18, 1917—"Locomotive Fireboxes." By *Mr. J. T. Anthony.*

March 15, 1917—"Evolution of Chilled Car Wheel." By *Mr. F. O. Bunnell.*

May 17, 1917—"The Edison Storage Battery Car." By *Dr. F. N. Koziell.*

July 19, 1917—"What is Required of Railroads in Present War." By *Mr. A. W. Thompson.*

THE ANNUAL MEETINGS OF THE SOCIETY ARE HELD IN CONNECTION WITH THE CONVENTIONS OF THE M. C. B. AND A. R. M. M. ASSOCIATIONS.

Chairman, A. J. Merrill, *Southern & Southwestern Railway Club*
Vice-Chairman, W. E. Cade, Jr., *New England Railway Club*
Secretary-Treasurer, Harry D. Vought, *New York Railroad and Central Railway Clubs, New York City*

The Annual Meeting of 1917 was not held on account of the War.

In Memoriam

LAURENCE W. FRANK

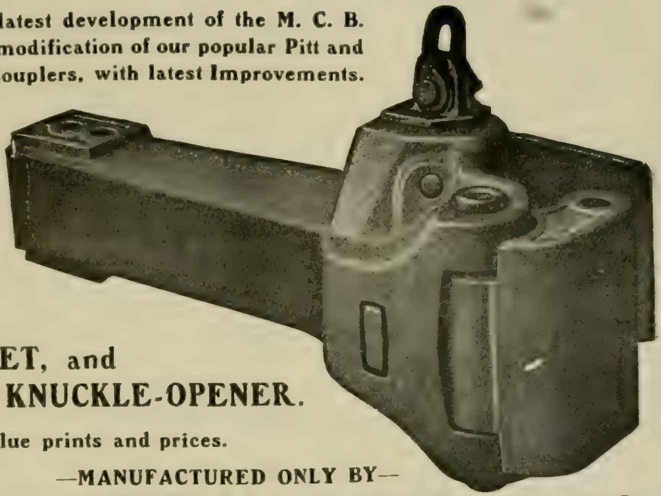
Died, April 30, 1917

HARRY L. ALLEN

Died, August 31, 1917

THE PENN COUPLER

Our latest development of the M. C. B. Coupler, a modification of our popular Pitt and Janney X Couplers, with latest Improvements.



LOCK-
TO-
THE-
LOCK,

LOCK-SET, and
KNUCKLE-OPENER.

Send for blue prints and prices.

—MANUFACTURED ONLY BY—

THE McCONWAY & TORLEY CO.,
PITTSBURGH, PA.

Our Best Salesman!

Any of the over FORTY Railroad Systems in the United States using our STREET STOKERS and MECHANICAL COAL PUSHERS.

LOCOMOTIVE STOKER CO.

General Office and Works
PITTSBURGH

50 Church Street
NEW YORK CITY

Railway Exchange
CHICAGO

PINTSCH MANTLE LIGHT

The system that has made good wherever it has been applied . . . .

SAFETY ELECTRIC LIGHT

Type "F" regulation ensures constant lamp voltage and long lamp life .

The Safety Car Heating & Lighting Co.

Chicago, Philadelphia, Washington, Boston,
St. Louis, San Francisco, Montreal

2 Rector St., New York

KING
METALLIC
PACKINGS

for Locomotive Piston Rods, Valve Stems & Air Pumps

SECURITY WRIST PIN
LEACH SANDERS
GOLLMAR BELL RINGER
INDESTRUCTIBLE OIL CUP
BRAIDED SWAB, ETC.

The U. S. Metallic Packing Co.
PHILADELPHIA

This Space For Sale

RAILWAY STEEL-SPRING COMPANY,

Springs,

Steel Tired Wheels,

Locomotive and Car Wheel Tires.

GENERAL OFFICE, 30 CHURCH STREET, NEW YORK

BRANCH OFFICES:—CHICAGO, ST. LOUIS, ST. PAUL, WASHINGTON, D. C.

Building Bigger Business by Better Methods

G-E Motors and Control increase production and reduce maintenance

WHEN you cut down manufacturing costs—up go your profits. When you increase your production—when you increase the quality of your products—when you decrease spoilage—*up go your profits.*

When you make it easier for an employee to produce more, you make it easier for him to earn more; and you find it easier to get the better kind of help and much easier to keep them. *And up go your profits.*

When you cut down your power costs, when you cut down maintenance of plant —when you reduce overhead supervision —when you lessen breakage of machinery —when you reduce stoppage of machinery —these mean *more profits.*

These advantages and a greatly increased capacity for service to your customers come to plants equipped with G-E Motor Drive.

We will gladly send a member of our Engineering Organization who will study the requirements and conditions of your plant, and tell you how, where and why G-E Motor Drive will give you manufacturing advantages.

G-E Motor Drive

GENERAL ELECTRIC COMPANY

General Office, Schenectady N.Y. Sales Offices in all large cities

7004

STANDARD STEEL CAR COMPANY

OFFICES
General Offices: Frick Bldg., PITTSBURGH, PA.
NEW YORK: 170 Broadway
CHICAGO: Fisher Building

WORKS
BUTLER, PA.
NEW CASTLE, PA.
HAMMOND, IND.

STEEL AND COMPOSITE

FREIGHT CARS

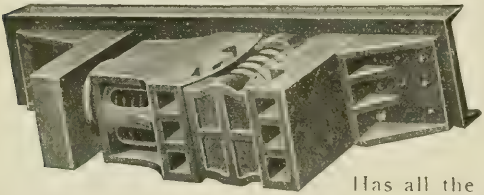
For all Classes of Service, from our Standard Designs, or according to Specifications of Purchasers.

Steel Car Underframes

TRUCKS, BOLSTERS, BRAKE BEAMS, ETC.

Capacity 50,000 Cars per Annum

INQUIRIES SOLICITED



USE BUTLER DRAFT GEARS

FRICTION RIGGING

PIPER PATENTS

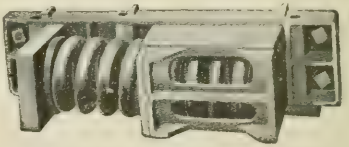
200,000 lbs. Capacity.

Has all the points of a Perfect Gear

TANDEM SPRING ATTACHMENTS

6¼x8 or 8x8 DRAFT SPRINGS

PERFECT SPRING PROTECTION



Butler Drawbar Attachment Co.

Send for Catalog CLEVELAND, OHIO

SCHAEFER

DROP-FORGED

FOUNDATION BRAKE GEAR DETAILS,

COMBINE

MORE STRENGTH WITH LESS WEIGHT

Schaefer Equipment Company

Oliver Building Pittsburgh, Pa.

STANDARD STEEL PLATFORMS

ARE IN USE BY 281 COMPANIES

SESSIONS—STANDARD FRICTION DRAFT GEARS

ARE IN USE BY 205 COMPANIES

—BOTH MADE BY—

THE STANDARD COUPLER CO.

CHICAGO: People's Gas Building NEW YORK: 30 Church St.

J-M RAILROAD SUPPLIES

Roofings
Packings
Gaskets
Pipe Coverings
Hair Felt
Smoke Jacks
Asbetos Wood
Waterproofing
Corks

Fibre Conduit
Locomotive Lagging
Flexible Armored Squirt,
  Tank, Car Heating, Air
  Brake and Air Signal Hose
Air Brake Expander Ring
Steel Car Insulation
Underground Conduit
Asbestus Cements

Brake Lining and Blocks
Electrical Supplies
Mastic Flooring
Speedometers
Fire Extinguishers
Manual Slack Take Up
  for Air Brakes
Vitribestos Stack Lining
Refrigerator Car Insulation

Write for Catalogs

H. W. JOHNS-MANVILLE COMPANY

NEW YORK CITY
Branches in 54 Large Cities

Union Steel Casting Company,

PITTSBURGH, PA.

Steel Cast Locomotive Frames, Driving Wheel Centers, and Miscellaneous Locomotive Castings.

Vanadium Steel Castings a Specialty

VAPOR CAR HEATING CO., Inc.

RAILWAY EXCHANGE CHICAGO

Successors to

Chicago Car Heating Co.

Standard Heat & Ventilation Co., Inc.

NEW YORK
30 Church
WASHINGTON, D. C.
Munsey Bldg.

Montreal,
Que.

BOSTON, MASS.,
53 State Street
ATLANTA, GA.,
Candler Bldg.

Freight and Passenger

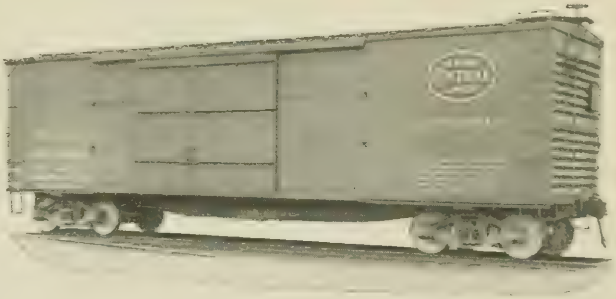
CARS

Of Every Description

Pressed Steel Specialties

Pressed Steel Car Company

New York Pittsburgh Chicago St. Paul
Washington, D. C.



FOR

GREATER EFFICIENCY

USE

DAVIS SOLID-TRUSS BRAKE BEAMS

FOR

Freight and Passenger Equipment.

ALSO

Pressed Steel Journal Box Lids.

DAVIS BRAKE BEAM CO.,

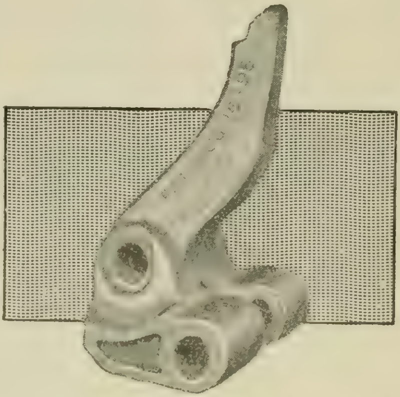
JOHNSTOWN, PA.

FRANK J. LANAHAN, Pres. CHAS. J. GRAHAM, Vice-Pres. GEO. W. FOX, Secretary

STUCKI
Side Bearings
SAVE WHEELS, RAILS, POWER
AVOID DERAILMENTS

A. Stucki Co.
Oliver Building
PITTSBURGH,
PA.

This Space For Sale



For Those "Break-In-Twos"

AVOID the delays and dangers in chaining up "break-in-twos" and setting out at the first siding. Take your trains right in to terminals coupled up with the Gilman-Brown Emergency Knuckle.

Fits practically all types of M. C. B. couplers with a *close* and *normal* coupling—even where one pin lug is broken from the draw head; air line can be safely coupled up and maintained without dummy hose.

For more than ten years the standard repair knuckle on the leading railways of the country, is your assurance of its economy and dependability.

Let us tell you more about this time saver.
Write for literature.

The Q AND C Co.

NEW YORK
90 West Street

St. LOUIS
Railway Exchange Bldg.

CHICAGO
Peoples' Gas Bldg.

GILMAN-BROWN
Emergency Knuckle

SUYDAM'S Protective PAINTS
For Freight Cars and Structural Steel Work
—MANUFACTURED BY—
M. B. SUYDAM COMPANY,
OFFICE AND WORKS, 61ST AND BUTLER STS.,
BELL 'PHONE, 343 FISK. PITTSBURGH, PA

This Space For Sale.

Carnegie L
of Pittsbu

FOR SALE

BRADY BRASS CO.
MANUFACTURERS OF
CYPRUS BRONZE FOR LOCOMOTIVE and CAR BEARING USE
ENGINE CASTINGS BABBITT METALS
JOURNAL BEARINGS MOTOR BEARINGS
General Office and Works, 170-182 Fourteenth St. and 169-175 Fifteenth St., Jersey City, N. J.
DANIEL M. BRADY, PRESIDENT

TYPE A SUPERHEATER LOCOMOTIVES
Make firing easier Save coal and water
Haul longer trains Maintain faster schedules
LOCOMOTIVE SUPERHEATER COMPANY
30 Church St., New York. Peoples Gas Bldg., Chicago.

OFFICIAL PROCEEDINGS
RAILWAY CLUB OF PITTSBURGH
$1.00 Per Year 20¢ Per Copy
Vol. XVI. OCTOBER 26, 1917 No. 9

ANNUAL MEETING, ELECTION OF OFFICERS, SMOKER-VAUDEVILLE, NAMES OF MEMBERS CONSTITUTION AND BY-LAWS.

Freight Car Forgings
STEEL CAR FORGE COMPANY
"FORGING SPECIALISTS"
PITTSBURGH NEW YORK CHICAGO

FOR SALE

Electrical Uses
ARISTOS
"COPPERWELD"
Mechanical Uses
A COPPER CLAD STEEL WIRE
Product of the COPPER CLAD STEEL CO., Pittsburgh, Pa.
Drawn and Sold Exclusively by
PAGE WOVEN WIRE FENCE CO., - - Monessen, Pa.

FOR SALE

TORCHES

Gem Torches Save You Money

Exhaustive tests by largest railway systems have proven that Gem Brazed Seam Torches do save money. Let us prove it. Send for free sample and information.

Gem Manufacturing Company
PITTSBURGH, PA.

Graham Nut Company
PITTSBURGH, PA.

MANUFACTURERS OF

Hot Pressed Nuts, Cold Punched C. & T. Nuts
Bolts, Lag Screws, Washers, Etc

This Space For Sale

Better Bearings

Made by anti-friction specialists in a specially equipped plant with exceptional shipping facilities.

JOHNSON

Car and Locomotive Bearings

No matter whether you do or don't make your own, we believe we can furnish you with some interesting data.

Learn now whether you are paying too much for this item.

Send specifications and blue prints today for our quotation

JOHNSON BRONZE COMPANY

Gen. Offices and Works, New Castle, Pa.

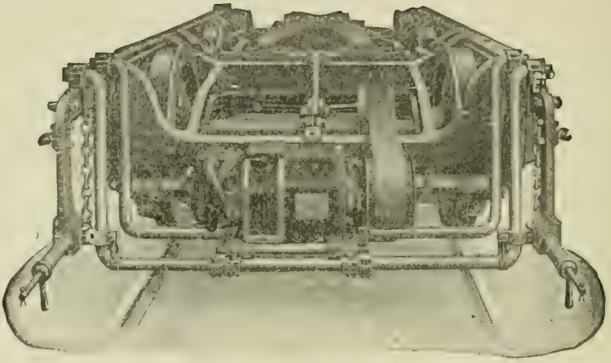
SALES OFFICES

New York Buffalo Pittsburgh Cleveland

Cincinnati Detroit Chicago San Francisco

THE GOULD "SIMPLEX" SYSTEM OF

ELECTRIC CAR LIGHTING

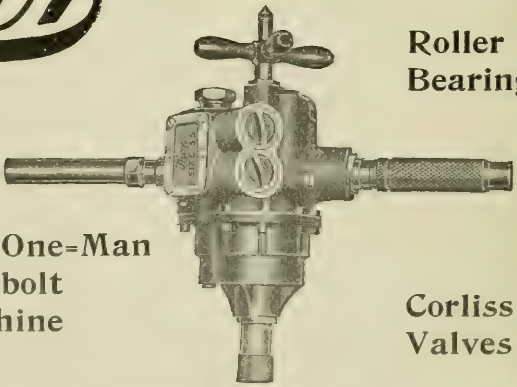


GOULD COUPLER CO.

NEW YORK

Thor

Roller-Bearing Compound Piston Air Drills



Roller Bearings

No. 32 L

The One=Man Staybolt Machine

Corliss Valves

FURNISHED ON TRIAL FREE. WRITE NEAREST BRANCH

INDEPENDENT PNEUMATIC TOOL COMPANY

Chicago : New York : Pittsburgh : Detroit : San Francisco : Birmingham : Montreal, Que.

MANNING, MAXWELL & MOORE,

ROBT. A. BOLE, MANAGER, PITTSBURGH BRANCH

◄PARK BUILDING►

LONG DISTANCE TELEPHONE CALL. GRANT 67

Railway and Machinists' Tools and Supplies, Electric Traveling Cranes, Compressors, Pneumatic Hoists, Riveters and complete Machine Shop and Foundry Equipment

---

NATIONAL CAR WHEEL COMPANY

MANUFACTURERS OF

"STAR SPECIAL"

Reg. U. S. Patt. Off.

CHILLED CAST IRON CAR WHEELS

WORKS:
Rochester, N. Y. Pittsburgh, Pa.
Sayre, Pa. Cleveland, O.
New York City, N. Y.

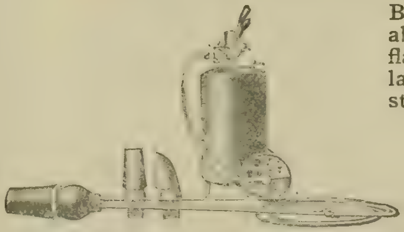
General Offices:
PITTSBURGH, PA.
New York Office:
556 WEST 34th STREET
Phila. Office:
506 FRANKLIN BANK BLDG.

BRAKE SHOES

AMERICAN BRAKE SHOE
& FOUNDRY COMPANY

30 Church St., New York
322 So. Michigan Ave., Chicago
Chattanooga, Tenn.

MAHR PATENT NO. 1-C TORCH FOR STEEL CAR REPAIRING



Burns the cheapest oil obtainable and produces a big intense flame that will quickly heat the largest sills, bolsters and other steel parts for straightening.

Mahr Manufacturing Co.

MINNEAPOLIS

NATHAN MANUFACTURING CO.
Amity and Lawrence Streets
FLUSHING, LONG ISLAND, N. Y.
1612 Old Colony Building, Chicago.

Monitor, Simplex and Nathan Injectors for Locomotives

AND

Sight-Feed Lubricators.

All Specially arranged for High-Pressure Engines.

STEAM FIRE EXTINGUISHERS FOR SWITCHING AND YARD ENGINES.

Boiler Washers, Boiler Testers, Rod and Guide Oil Cups, Etc.

— SOLE AGENCY FOR THE —

Coale Muffler & Safety Valve Co., Inc.

SIPE'S №. JAPAN OIL TRADE MARK REGISTERED J.B.SIPE & CO. MANUFACTURERS. ALLEGHENY, PA.

ESTABLISHED 1884

SIPE'S JAPAN OIL

"STRENGTHENS, DRIES, AND WATERPROOFS;
Add Sipe's Japan Oil And Improve the Paint".

IN DAILY USE BY ALL THE LEADING RAILROADS IN THE UNITED STATES

MANUFACTURED ONLY BY

CHICAGO ILL. **JAMES B. SIPE & CO.** PITTSBURGH, PA.

LOCOMOTIVE BLOW-OFF

DOES SATISFACTORY WORK ON MANY ROADS.

Can be worked from cab or foot board while running.

A catalog or call by Representative for the asking.

Homestead Valve Mfg. Co.,
Works: Homestead, Pittsburgh, Pa.

=: FARLOW DRAFT ATTACHMENT :=

For { **TWIN M. C. B. DRAFT SPRINGS**
OR
FRICTION DRAFT GEARS }

THE T. H. SYMINGTON CO.

New York Chicago Baltimore Rochester

BALL'S
VARNISH REMOVER

OXOLIN
REGISTERED
THE IDEAL PAINT OIL

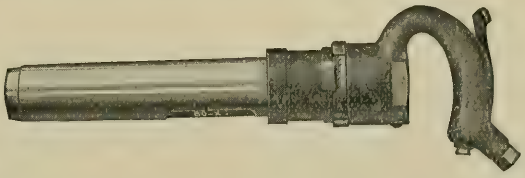
B. C.
SPIRITS

Ball Chemical Co.

CHICAGO Office,
63 W. Van Buren Street.

Fulton Bldg., PITTSBURGH, PA.

Logical Construction
is a feature of
BOYER
Pneumatic Hammers



No. 80X Boyer Riveting Hammer. Capacity 1⅜ inches.
Length overall only 21⅜ inches.

Boyer Hammers are made in three parts, cylinder, handle and valve—a construction which facilitates examination, cleaning and repairs, and extends the life of the tool indefinitely.

Write for Hammer Bulletin 124.

CHICAGO PNEUMATIC TOOL CO.

PITTSBURGH: 10 and 12 Wood St

1052 Fisher Bldg.
CHICAGO

Branches Everywhere

52 Vanderbilt Ave.
NEW YORK

H. H. HEWITT, PRESIDENT. W. H. CROFT, VICE-PRESIDENT

MAGNUS METAL

MEETS ALL HIGH-GRADE REQUIREMENTS.

IT IS THE STANDARD METAL

FOR LOCOMOTIVE WEARING PARTS,

JOURNAL BEARINGS FOR { FAST PASSENGER CAR SERVICE,
HEAVY FREIGHT CAR SERVICE.

MAGNUS COMPANY

111 BROADWAY, NEW YORK.

DURABILITY COUNTS

DIXON'S SILICA GRAPHITE PAINT

is the "LONGEST SERVICE" paint. Recommended and largely used as standard by railroad economists, and engineers, throughout the entire world, for bridges, steel cars, tanks, signal apparatus etc. Made in FIRST QUALITY only. Write us for long service records and booklet No. 152-B.

Made in JERSEY CITY, N. J., by the

JOSEPH DIXON CRUCIBLE COMPANY

DXN TRADE MARK ESTABLISHED 1827 DXN TRADE MARK

HAND BRAKE MECHANISM

FOR ROUND OR SQUARE SHAFTS

Adaptable to All Types of Cars

Write for Catalogue No. 21

The National Malleable Castings Co.

Cleveland Chicago Indianapolis Toledo
Sharon, Pa. Melrose Park, Ill.

PEERLESS

MECHANICAL RUBBER GOODS AND PACKINGS HAVE THAT DURABILITY DEMANDED BY RAILROADS.

Peerless Rubber Mfg. Co.

31 WARREN ST. NEW YORK

BOSTON CHICAGO PHILADELPHIA MINNEAPOLIS

Specialization

Produces Highest Efficiency

* * * * *

Air Brake building is a business in itself—and one of the most important, because of the lives and property the Air Brake protects. It is a specialist's business, and to obtain best results, should be conducted by specialists.

* * * * *

Westinghouse Air Brake Co.

General Offices and Works, Wilmerding, Pa.

Westinghouse
Electric Arc Welding Outfits

have reduced the repair costs in many railroad shops.
They save their cost in three months time.
Full information on request.—Booklet 3049-A.

Westinghouse
Electric Motors for Railroad Shops

Pressed-Steel Types for either alternating or direct current. Rugged, serviceable, efficient and long lived. Full information on request.

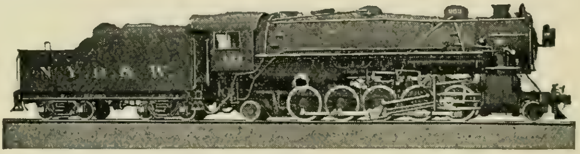
Westinghouse Electric & Manufacturing Co.

Sales Offices In All
Large American Cities

W

EAST PITTSBURGH
PENNSYLVANIA

2-10-2 TYPE LOCOMOTIVES



Total Weight of Engine, 352,500 pounds; Weight on Drivers, 293,000 pounds; Diameter of Drivers, 57 inches; Tube Length, 17 feet; Boiler Pressure, 190 pounds; Cylinders, 28x32 inches; Maximum Tractive Power, 71,200 pounds.

Because of its long rigid wheel base many railroad officials have had to eliminate the 2-10-2 type when considering more powerful locomotives.

Lateral motion driving axles and boxes were applied to the New York, Ontario & Western, 2-10-2 type locomotives to reduce the rigid wheel base to that which is in common use on Consolidation and Mikado type locomotives, and at the same time secure the advantages of the ten-coupled wheel arrangement with the resulting increased capacity of the locomotives.

Write us for further information regarding the lateral motion device.

AMERICAN LOCOMOTIVE COMPANY

30 CHURCH STREET, NEW YORK

YOU GET THE MAXIMUM OF DURABILITY FROM OUR

SEMAPHORE ENAMEL

All colors—Write to us for samples.

Yarnall Paint Company

MANUFACTURERS - - - PHILADELPHIA

READING SPECIALTIES COMPANY

GENERAL OFFICE AND WORKS, READING, PA.

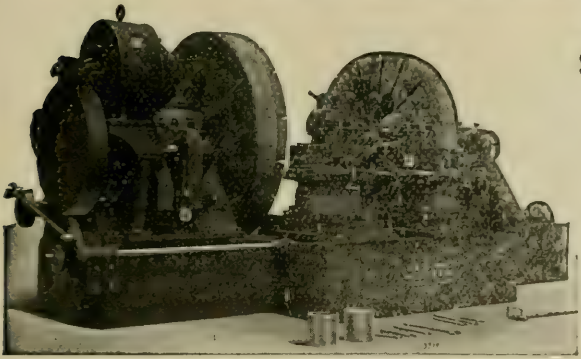
BRANCH OFFICES

New York, 111 Broadway
Chicago, Railway Exchange Bldg.
Atlanta, Fourth Nat'l. Bank Bldg.
Washington, Colorado Building.
Pittsburgh, Oliver Building.
Denver, First National Bank Bldg.
Los Angeles, W. H. Hellman Bldg.

"Reading" Guard Rail Clamps
"Reading" Rail Benders
"Reading" Rerailers & Clamps
"Reading" Compromise Joints

Railroad Repair Shop Equipment

Combining all modern features for
rapid, convenient operation.



MACHINE TOOLS

STEAM HAMMERS

ELECTRIC
TRAVELING
CRANES

P. & W.
SMALL TOOLS
AND M. C. B.
GAUGES

Niles New Model Driving Wheel Lathe
Has broken all wheel shop records.

WRITE FOR CATALOGU

NILES-BEMENT-POND CO.

111 Broadway, New York. Pittsburgh Office, Frick Building.

500 RAILROAD SHOPS

Have Adopted Thermit Welding as a Standard for Frame Repairs

The list of railroads using Thermit includes practically every system from the small road having only a few locomotives to the largest system having many thousand locomotives.

The superheated liquid Thermit steel is produced in bulk and poured all at once into a mold surrounding a broken section, resulting in the perfect amalgamation of the Thermit steel with the parts with which it comes in contact. The fact that those parts are first preheated, makes the weld doubly sure.

Remember that the greatest railway systems in the world use hundreds of thousands of pounds of Thermit. They do not use it for any reason except that it "delivers the goods," and has proved itself the most profitable investment.

Full information is given in our instructive pamphlet No. 2167, "Thermit Locomotive Repairs," and shows how effectively and economically the process can be used. Send for a copy today.

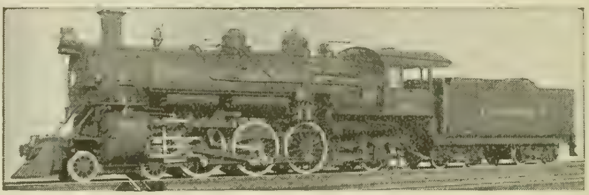
GOLDSCHMIDT THERMIT COMPANY

120 BROADWAY, NEW YORK

329-333 Folsom St., San Francisco; 103 Richmond St., W.,
Toronto, Ont.; 7300 So. Chicago Ave., Chicago

THE BALDWIN LOCOMOTIVE WORKS

PHILADELPHIA, PA., U. S. A.



LOCOMOTIVES

OF EVERY DESCRIPTION

Electric Motor and Trailer Trucks

SECURITY

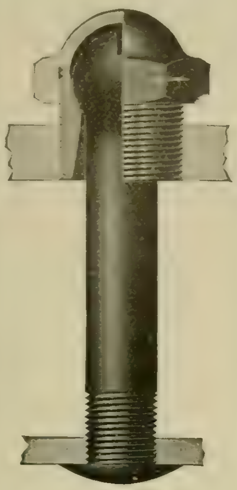
SECTIONAL ARCH

Makes staybolt inspection easy.
Saves flue troubles.
Reduces engine failures.
Easy to apply and remove.
Small brick of light weight.
Cools off quickly.
Many other good features.

AMERICAN ARCH COMPANY

30 Church Street,
New York

McCormick Building,
Chicago



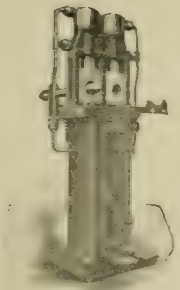
The Best Staybolt
FOR LOCOMOTIVE FIREBOXES

Railroads Are Now Using
The Tate Flexible Staybolt
At the Rate of
1,250,000 A YEAR

Our Services Are Always
At Your Command

FLANNERY BOLT CO.
Vanadium Building
PITTSBURGH, PENNA.
B. E. D. Stafford, General Manager

J. Rogers Flannery & Co.
SELLING AGENTS
Vanadium Building
PITTSBURGH, PENNA.



The Draper Manufacturing Co.
Manufacturers of
PNEUMATIC FLUE WELDERS

For Scarfing, Welding and Swedging Boiler Flues up to 4" Diameter.

Pneumatic Tube Welding Machines for Welding and Swedging Superheater Tubes.

Flue Reclaiming Equipment used in connection with Pneumatic Flue Welders.

HUNT-SPILLER IRON
HAS THE
STRENGTH AND WEARING QUALITIES
THAT ARE ABSOLUTELY NECESSARY IN
LOCOMOTIVE CASTINGS
PRICES MODERATE RESULTS GREAT
Manufactured Only By
Hunt-Spiller Manfg. Corporation
W. B. LEACH, President and Gen'l Manager.
J. G. PLATT,
Sales Manager.
OFFICE AND WORKS:
3 DORCHESTER AVENUE
SO. BOSTON, MASS.

GALENA-SIGNAL OIL COMPANY

FRANKLIN, PENNA.

Sole manufacturers of celebrated

GALENA LUBRICANTS

PERFECTION VALVE and SIGNAL OILS

and

Galena Railway Safety Oil

Manufactured for

STEAM AND ELECTRIC RAILWAY USES EXCLUSIVELY

Guaranteed Cost **Expert Service Free**

CHARLES MILLER,
Chairman.

S. A. MEGEATH,
President.

FORT PITT MALLEABLE IRON CO.

PITTSBURGH, PENNA.

MANUFACTURING SPECIALISTS
OF MALLEABLE CASTINGS
FOR THE RAILROAD AND
CAR COMPANY TRADE.

FEATURES

Superior Quality

Expeditious Delivery

Consistent Price

INDEX—ADVERTISERS.

NAME — Page
American Arch Co. x
American Brake Shoe & Foundry Co. iii
American Locomotive Company. . . viii
Baldwin Locomotive Works. x
Ball Chemical Co. v
Brady Brass Co. . . . . Front Cover
Butler Drawbar Attachment Co. . . xviii
Chicago Pneumatic Tool Co. v
Davis Brake Beam Co. xxi
Dixon, Jos., Crucible Co. vi
Flannery Bolt Co. xi
Fort Pitt Malleable Iron Co. xii
Galena Signal Oil Co. xii
General Electric Co. xvii
Gem Manufacturing Co. . . . Front Cover
Goldschmidt Thermit Co. ix
Gould Coupler Co. ii
Graham Nut Company. . . . Front Cover
Homestead Valve Mfg. Co. iv
Hunt-Spiller Mfg. Co. xi
Independent Pneumatic Tool Co. . . . ii
Johns-Manville Co. xix
Johnson Bronze Co. i
Locomotive Stoker Co. xv
Locomotive Superheater Co. . . . . Front Cover
Magnus Company. vi
Mahr Manufacturing Co. iii
Manning, Maxwell & Moore. iii
McConway & Torley Company. xv

NAME — Page
Nathan Manufacturing Co. iv
National Car Wheel Co. iii
National Malleable Castings Co. vi
Niles-Bement Pond Co. ix
Page Woven Wire Fence Co. . . . . Front Cover
Peerless Rubber Mfg. Co. vi
Pressed Steel Car Co. xx
Reading Specialties Co. viii
Railway Steel Spring Co. xvi
Safety Car Heating & Lighting Co. xvi
Schaefer Equipment Co. xviii
Sipe, James B., & Co. iv
Standard Coupler Co. xix
Standard Steel Car Co. xviii
Steel Car Forge Co. . . . . . . Front Cover
Stucki Co., A. xxi
Suydam, M. B. Co. . . . . Back Cover
The T. H. Symington Co. v
The Draper Manf'g Co. xi
The Q. & C. Co. xxii
The U. S. Metallic Packing Co. xvi
Union Spring & Mfg. Co. xiv
Union Steel Casting Co. xix
Vapor Car Heating Co., Inc. xix
Westinghouse Air Brake Co. vii
Westinghouse Electric & Mfg. Co. . vii
Yarnall Paint Co. viii

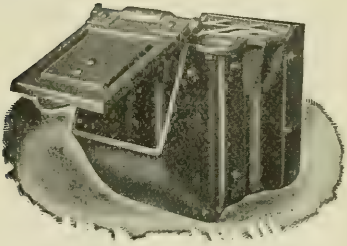
Union Spring & Manufacturing Co.

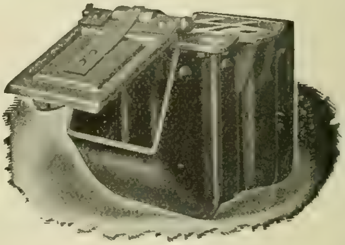
SPRINGS

Kensington All Steel Journal Boxes

PRESSED STEEL JOURNAL BOX LIDS

STEEL CASTINGS





Lightest and Strongest M. C. B.
Journal Boxes Made.

WORKS:
NEW KENSINGTON, PA.

GENERAL OFFICE:
First National Bank Bldg., Pittsburgh, Pa.

NEW YORK - 50 Church Street.
CHICAGO - Fisher Building.
ST. LOUIS - Missouri Trust Building.
RICHMOND, VA., AMERICAN NATIONAL BANK BUILDING.
LOUISVILLE, KY., 42 Todd Building.

OFFICIAL PROCEEDINGS
OF
The Railway Club of Pittsburgh

Organized October 18, 1901.

Published monthly, except June, July and August, by The Railway Club of Pittsburgh, J. B. Anderson, Secretary. General Offices, Penna. R. R., Pittsburgh, Pa.

Entered as Second Class Matter February 6, 1915, at the Postoffice at Pittsburgh, under the Act of March 3, 1879.

VOL. XVI.
No. 9.

Pittsburgh, Pa., October 26, 1917.

$1.00 Per Year
20c Per Copy

OFFICERS FOR 1916—1917

President
J. G. CODE,
Pittsburgh, Pa.

First Vice President
H.H. MAXFIELD,
Supt. Motive Power, P. R. R.,
Pittsburgh, Pa.

Second Vice President
D. M. HOWE,
Railway Supplies,
Pittsburgh, Pa.

Secretary
J. B. ANDERSON,
Chief Clerk, Supt. M. P., P. R. R.,
Pittsburgh, Pa.

Treasurer
F. H. STARK,
Genl. Supt., Montour R. R.,
Coraopolis, Pa.

Executive Committee

L. H. TURNER, Supt. Motive Power, P. & L. E. R. R., Pittsburgh, Pa.
D. J. REDDING, Asst. Supt. Motive Power, P. & L. E. R. R., McKees Rocks, Pa.
F. R. McFEATTERS, General Supt. Union R. R., East Pittsburgh, Pa.
A. G. MITCHELL, Supt. Monon. Div., Penna. R. R., S. S., Pittsburgh, Pa.
F. M. McNULTY, Supt. Motive Power, Monon. Conn. R. R., Pittsburgh, Pa.

Finance Committee

STEPHEN C. MASON, Secretary, The McConway & Torley Co., Pittsburgh, Pa.
E. K. CONNEELY, Asst. to Vice President, P. & L. E. R. R., Pittsburgh, Pa.
CHAS. A. LINDSTROM, Asst. to President, Pressed Steel Car Co., Pittsburgh, Pa.
L. C. BIHLER, Traffic Manager, Carnegie Steel Co., Pittsburgh, Pa.
WALTER V. TURNER, Manager of Engineering,
Westinghouse Air Brake Co., Wilmerding, Pa.

Membership Committee

FRANK J. LANAHAN, President, Fort Pitt Malleable Iron Co., Pittsburgh, Pa.
A. STUCKI, Engineer, Pittsburgh, Pa.
C. O. DAMBACH, Supt., Pgh. & W. Va. Ry., Pittsburgh, Pa.
HARRY HOWE, Inspector of Castings, Pressed Steel Car Co., McKees Rocks, Pa.
R. L. KLEINE, Chief Car Inspector, P. R. R., Altoona, Pa.
B. E. D STAFFORD, General Manager, Flannery Bolt Company, Pittsburgh, Pa.
SAMUEL LYNN, Master Car Builder, P. & L. E. R. R., McKees Rocks, Pa.

Entertainment Committee

D. H. AMSBARY, District Manager, Dearborn Chemical Co., Pittsburgh, Pa.
HARRY MURDOCH, President, H. Murdoch & Co., Pittsburgh, Pa.
E. C. SATTLEY, General Manager, Page Woven Wire Fence Co., Monessen, Pa.

Past President

J. H. McCONNELL	October, 1901, to October, 1903.
L. H. TURNER	November, 1903, to October, 1905.
F. H. STARK	November, 1905, to October, 1907.
* H. W. WATTS	November, 1907, to April, 1908.
D. J. REDDING	November, 1908, to October, 1910.
F. R. McFEATTERS	November, 1910, to October, 1912.
A. G. MITCHELL	November, 1912, to October, 1914.
F. M. McNULTY	November, 1914, to October, 1916.

* Deceased.

Meetings held fourth Friday of each month, except June, July and August.

THE RAILWAY CLUB OF PITTSBURGH

"RESOLVED, by The Railway Club of Pittsburgh, that any of its members who have now, or who may, during the present World's War, become one of our Country's defenders by joining the Military or Naval Forces of the United States, or who by reason of membership in the American Red Cross are called away from home, shall be exempt from dues and continued as members in good standing until their return home from the War, and that the Secretary shall prepare a Roll of Honor showing such members for the records of the Club."

—ROLL OF HONOR—

ATTERBURY, W. W., Vice-President, Penna. R. R., Broad Street Station, Philadelphia, Pa. (Brigadier-General, Director General of Transportation, American Expeditionary Forces).

BRASHEAR, DR. JOHN A., 1954 Perrysville Avenue, N. S., Pittsburgh, Pa. (National Research Council, U. S. A.)

BROWNSCOMB, G. J., Clerk, Union R. R. Co., East Pittsburgh, Pa. (Canadian Regiment, overseas).

DEAN, RANDOLPH F., Signal Repairman, P. C. C. & St. Louis Railway, 729 Washington Avenue, Carnegie, Pa. (Battery 4, R. O. T. C., Military Branch, Chattanooga, Tennessee).

HOTT, G. H., Assistant Yard Master, Monongahela R. R. Co., Brownsville, Pa. (Corporal, Supply Company, 330th Infantry, Camp Sherman, Ohio).

HOWE, HARRY, Inspector of Castings, Pressed Steel Car Co., McKees Rocks, Pa. (Captain, 107th Field Artillery Supply Company, Camp Hancock, Georgia).

HUFF, GEORGE F., JR., Assistant Road Foreman Engines, Pennsylvania R. R., Harrisburg, Pa. (Captain, 19th U. S. Engineers (Railway) American Expeditionary Forces).

KATZIN, WILLIAM, Draftsman, Pressed Steel Car Company, 701 Broadway, McKees Rocks, Pa. (Private, Company E, 319th Infantry, Camp Lee, Va.)

LINDNER, W. C., Foreman Car Repairs, Penna. R. R., 2125 Union Avenue, Altoona, Pa. (Captain E. O. R. C. 35th Engineers (Railway) Camp Grant, Ill.)

LOCKWOOD, CHAS. H., Draftsman, Pressed Steel Car Co., 366 Lincoln Avenue, Bellevue, Pa. (Private, Company A, 319th Infantry, Camp Lee, Va.)

MAXFIELD, H. H., Supt. Motive Power, Penna. R. R., Pennsylvania Station, New York, N. Y. Colonel, 19th U. S. Engineers (Railway) American Expeditionary Forces).

MORRIS, H. W., Purchasing Agent, Pittsburgh & West Virginia Railway, 115 Belmont Avenue, Crafton, Pa. (First Lieutenant, Ordinance Department, Production Section, Carriage Division).

MORRIS, J. M., Assistant Master Mechanic, Penna. R. R., Verona, Pa. (First Lieutenant, E. O. R. C., 35th Engineers (Railway) Camp Grant, Ill.)

MURPHY PAUL F., Civil Engineer, Penna. R. R., Aspinwall, Pa. (First Class Machinist Mate, Naval Reserves, 2nd Naval District, Newport, R. I.)

RICHERS, G. J., Assistant Master Mechanic, Penna. R. R., Verona, Pa. (First Lieutenant, Headquarters Detachment, 15th U. S. Engineers, American Expeditionary Forces).

ROBBINS, F. S., Assistant Master Mechanic, Penna. R. R., 28th Street, Pittsburgh, Pa. (Captain, 19th U. S. Engineers (Railway) American Expeditionary Forces).

SMITH, CHANDLER P., General Manager, P. L. & W. R. R., Lisbon, Ohio. (First Lieutenant, Company 3, E. O. R. T. C. (Engineers).

WHITMAN, E. B., Assistant Road Foreman of Engines, Penna. R. R., Pittsburgh, Pa. (Captain, 19th U. S. Engineers (Railway) American Expeditionary Forces).

WILLIAMS, HAROLD S., Stenographer, Pressed Steel Car Co., 99 South Grant Street, Bellevue, Pa. (Private, 35th Engineers (Railway) Camp Grant, Ill.)

WIPPERMAN, F. B., Traveling Engineer, Ohio Injector Co., 1437 Monadnock Block, Chicago, Ill. (First Lieutenant, E. O. R. C., Company B, 311th Engineers, Camp Grant, Ill.)

NOTE—In order to keep the above Roll of Honor correct to date the Secretary will be glad to be advised of any additions or corrections thereto.

PROCEEDINGS OF MEETING, OCTOBER 26, 1917.

The Annual Meeting of The Railway Club of Pittsburgh was called to order at the auditorium of the German Club, Pittsburgh, Pa., at 8 o'clock, P. M., by Secretary Anderson in the absence of President Code.

The following gentlemen registered:

MEMBERS

Alleman, C. W.
Amsbary, D. H.
Anderson, J. B.
Armstrong, J. C.
Babcock, F. H.
Barney, Harry
Barth, J. W.
Battinhouse, J. M.
Bean, W.
Bell, R. P.
Berg, K.
Bihler, L. C.
Booth, J. K.
Bosley, N. D.
Braun, O. F.
Braun, W. S.
Brennan, E. J.
Brewer, W. A.
Brown, W. C.
Brunner, F. J.
Calvert, H. W.
Cartwright, W. E.
Cassiday, C. R.
Clark, C. C.
Cline, W. A.
Cocayne, W. H.
Conwell, F. L.
Conner, W. P.
Courtney, D. C.
Crawford, D. F.
Crenner, J. A.
Cunningham, W. P.
Dambach, C. O.
Dice, U. E.
Dickinson, F. W.
Donaldson, G. C.
Donaldson, D. B.
Durant, C. H.
Elsey, W. R.
Emery, E.
Endsley, Louis E.
Farquhar, L. C.
Ferren, R. O.
Forrest, C. H.
Freshwater, F. H.
Frey, A. R.
Gale, C. H.
Geisler, Jos. J.
Gellinger, C. W.
Gilg, Henry F.
George, M. E.
Graham, Harry C.
Gray, C. B.
Grieve, Robert E.
Gross, C. H.
Guay, John W.
Haag, Chas. E.
Hague, J. R.
Haynes, J. E.
Hill, J. F.
Hindman, S. M.
Hoffman, C. T.
Huchel, E. W.
Huchel, W. J.
Hudson, W. L.
Jones, L. B.
Karnes, W. T.
Kelly, H. B.
Kennedy, W. B.
Kindle, W. F.
Knapp, A. D.
Kohl, H. J.
Krahmer, E. F.
Lanahan, J. S.

Long, R. M.
Lansberry, W. B.
Llewelyn, W. R.
Lobez, P. L.
Loughridge, H. W.
Lynn, Saml.
Lyons, Robert S.
Matchett, H. K.
Meyer, W. J.
Meyers, J. M.
Mitchell, A. G.
Mitchell, John, Jr.
Morgan, D. G.
Mowry, E. H.
Murphy, W. J.
McBride, P. A.
McConn, G. E.
McDowell, D. W.
McFeatters, F. R.
McNulty, F. M.
Neal, J. T.
Neff, J. P.
Orchard, Charles
Painter, Joseph
Pfeil, John
Porter, C. D.
Pratt, I. D.
Prickman, W. R.
Proven, John
Rabold, W. E.
Rea, C. S.
Redding, D. J.
Reymer, C. H.
Ritts, W. H.
Runser, K. W.
Sadd, L. C.
Sampson, W. F.
Sattley, E. C.
Schaich, W. L.
Scheck, H. G.
Sheetz, E. S.
Shirk, A. R.
Shorthill, R. R.
Smith, J. B.
Snyder, J. Rush
Snyder, Joseph
Spielmann, J. A.
Stevenson, William
Stillings, Wm. R.
Stark, F. H.
Stucki, A.
Thomas, J. H.
Thurlby, A. R.
Tucker, J. L.
Turner, L. H.
Uhler, J. L.
VanKrogh, F. F.
Waggoner, R. E.
Wagner, G. R.
Walther, G. C.
White, H. L.
Williams, W. W.
Williamson, J. A.
Wolfe, L. L.
Yungbluth, B. J.
Zortman, C. E.

VISITORS.

Andrews, G. L.
Bankert, Chas. A.
Beatty, J. H.
Bowden, T. C.
Bugle, G.
Burgess, T. S.
Burgess, Wm. C.
Cady, W. M.
Canoel, F. E.
Carr, T. W.
Cavan, Harry
Cover, N. C.
Danielson, R. B.
Diebert, E. H.
Dittman, George
Donovan, J. J.
Doyle, Wm. E.
Eccles, J. H.
Ecker, F. D.
Edmundson, J. L.
Eichenlaub, P. F.
Elsey, R. G.
Ekis, C.
Erwin, J. C.

Fisher, H. W.
Flemming, H. W.
Fox, George W.
Frazier, L. E.
Friend, W. D.
Freyer, Elmer
Gardner, J. G.
Garratt, L. W.
Geyer, H. L.
Gillette, O. P.
Gilmore, A. G.
Graham, T. A.
Hagerty, J. W.
Halt, H. J.
Hart, Mr.
Hartley, J. W.
Harris, G. A.
Hazen, J. C.
Hedrick, P. H.
Hellriegel, W. H.
Hoffman, J. M.
Hofman, Philip, Sr.
Hopkins, T. C.
Houston, W. E.
Howe, M. E.
Inks, S. W.
Johnson, J. F.
Johnston, J. S.
Johnson, W. H.
Kaiser, Joseph
Kling, C. C.
Kropp, J. C.
Lally, James
Lepper, C. W.
Lineawear, H. E.
Lippincott, F. B.
Livingston, B. F.
Lockard, E. J.
Long, J. H.
Lowery, Joseph
Mackenzie, R. H.
Maconbray, R. J.
Maloney, J. H.
Mantle, E. H.
Marshall, C. H.
Marshall, S. S., Jr.
Martin, R. A.
Metz, G. M.
Meyer, F. N.
Miller, E. N.
Miller, S. W.
Mills, F. R.
Moore, Thomas F.
Moorhead, R. E.
Mornes, Thomas L.
McAbee, H. F.
McCanghan, J. C.
McCormick, C. H.
McCready, J. C.
MacGregor, Mr.
McGregory, Thomas
Nones, H. R.
Oeffner, Dr. P. J.
Osbourne, A. S.
Owens, F. C.
Peacock, W. W.
Poun, A. E.
Quick, O. A.
Quigley, G. E.
Rebstock, J. B.
Reymer, R. E.
Reynolds, D. J.
Richards, E. M.
Rominger, L. T.
Ryde, H. H.
Sayer, J. S.
Schweitzer, A. C.
Sheasley, R. A.
Sheridan, Thomas F.
Shiver, E. A.
Smith, C. B.
Smith, J. L.
Smith, William
Smythe, W. C.
Snitzer, N. E.
Stevenson, F. M.
Strasser, J. H.
Thomas, F. S.
Truschel, J. H.
Tunstall, William
Viehman, R. G.
Washburn, A.
Weber, D. M.
Weller, L.
Weisser, A. J.
Weissert, W. J.

Wibozen, A. R.	Woods, J. H.
Wilson, W. H.	Young, C. A.

SECRETARY ANDERSON: We have a telegram from President J. G. Code, who is in New York City, reading as follows:

> "Regret unavoidable absence tonight. Have notified one of your officers to do double duty."

Our First Vice-President, Lieut. Col. H. H. Maxfield, is serving the Colors in France, and reflecting honor upon this Club. The duty of presiding at this meeting of the Club therefore devolves upon our Second Vice-President, Mr. D. M. Howe.

VICE-PRESIDENT HOWE: Roll call will be dispensed with, as the record of attendance is had from the registration cards.

The minutes of the last meeting being in the hands of the printer, the reading of the same will be dispensed with.

The Secretary read the following list of applications for membership:

Carr, T. W., Drawing Instructor, P. & L. E. R. R., McKees Rocks, Pa. Recommended by J. A. Williamson.

Cline, N. T., Foreman Air Brake Shop, P. & L. E. R. R., 2733 Zephyr Avenue, Pittsburgh, Pa. Recommended by J. A. Williamson.

Donovan, J. J., Foreman, P. & L. E. R. R., 836 Russelwood Avenue, McKees Rocks, Pa. Recommended by H. B. Kelly.

Fendner, W. J., Engineer, Clark Car Company, 1639 Oliver Building, Pittsburgh, Pa. Recommended by Chas. H. Clark.

Grove, Samuel J., Gang Foreman, P. C. C. & St. Louis Railway, 1334 Pritchard St., Pittsburgh, Pa. Recommended by R. E. Staneart.

Hedrick, P. H., Erecting Shop Foreman, P. & L. E. R. R., 99 Hawthorn Avenue, Crafton, Pa. Recommended by O. F. Braun.

Hoffstot, John G., Assistant Efficiency Engineer, Pressed Steel Car Co., Farmers Bank Building, Pittsburgh, Pa. Recommended by Chas. A. Lindstrom.

Howe, M. E., Salesman, A. Wilhelm Co., 207 Fulton Building, Pittsburgh, Pa. Recommended by D. M. Howe.

Inks, S. W., General Foreman, P. & L. E. R. R., Newell, Pa. Recommended by H. B. Kelly.

Johnson, J. F., Engineer, Pittsburgh Plate Glass Co., Orchard Avenue, Bellevue, Pa. Recommended by A. Stucki.

Johnson, W. H., Brakeman, Carnegie Steel Co., 606 Ann Street, Homestead, Pa. Recommended by R. R. Shorthill.

Mackenzie, R. H., Railway Sales Manager, Underwood Typewriter Company, 641 Liberty Avenue, Pittsburgh, Pa. Recommended by C. S. Rea.

Meyer, Frank X., Chief Clerk, Stores Dept. P. & L. E. R. R., 1012 Third Street, McKees Rocks, Pa. Recommended by C. W. Alleman.

Mornes, Thomas L., Storekeeper, P. & L. E. R. R., McKees Rocks, Pa. Recommended by C. W. Alleman.

Moyer, O. G. A., Mechanic, Jones & Laughlin Steel Co., 2623 Brownsville Road, Carrick, Pa. Recommended by Adolph Jungbluth.

McAndrew, R., Supervisor of Stores, B. & L. E. R. R., Greenville, Pa. Recommended by J. K. Booth.

Noble, A. F., Factory Representative, Thomson Electric Welding Co., 603 Finance Building, Philadelphia, Pa. Recommended by D. H. Amsbary.

Rayburn, W. R., Salesman, Wolff Brush Company, 503 Lilley Ave., Columbus, Ohio. Recommended by D. M. Howe.

Sheridan, Thomas F., Chief Clerk to Supt. Motive Power, P. & L. E. R. R., 500 Chartiers Avenue, McKees Rocks, Pa. Recommended by J. A. Williamson.

Smith, William, General Foreman, P. & L. E. R. R., 313 Morrow Avenue, Carnegie, Pa. Recommended by J. A. Williamson.

Styers, J. V., General Freight Agent, B. & L. E. R. R., Union Arcade, Pittsburgh, Pa. Recommended by C. O. Dambach.

Strauss, I. H., Freight Agent Duquesne, Penna. R. R., Pittsburgh, Pa. Recommended by A. G. Mitchell.

Washburn, A., Road Foreman Engines, P. & L. E. R. R., Glassport, Pa. Recommended by H. B. Kelly.

Wilkins, Richard, Machinist, P. & L. E. R. R., 708 Island Ave., McKees Rocks, Pa. Recommended by D. C. Courtney.

VICE-PRESIDENT HOWE: Upon approval by the Executive Committee these gentlemen will become members, without further action, except the payment of one year's dues.

Next we will hear the Annual Report of the Secretary.

SECRETARY'S REPORT.

Pittsburgh, Pa., October 26, 1917.

To the Officers and Members of
The Railway Club of Pittsburgh,

GENTLEMEN:

I beg to submit a statement of some of the events closing the sixteenth year of the Club.

During the year death has removed from our midst the following members: U. G. Detwiler, G. E. Trautwein, Laurence W. Frank, Harry L. Allen and James J. Duer.

The following is a summary of the membership and financial conditions for the year up to and including this meeting:

MEMBERSHIP

Reported last year	881	
Received into membership during the year	185	
Additional Honorary members	2	
Reinstated	9	
		1077
Suspended for non-payment of dues	117	
Resigned	49	
Loss of address	8	
Removed by death	5	
		179
Present membership		898

FINANCIAL

RECEIPTS

In hands of Treasurer last year	$4,040.57	
From dues	2,340.00	
From advertising	2,160.62	
From sale of Proceedings	200.09	
From sale of tickets for Annual Smoker and Vaudeville	291.25	
From interest on Savings account	65.16	
From interest on checking account	21.27	
Investment in Liberty Bonds	2,000.00	
Total		$11,118.96

DISBURSEMENTS

Printing Proceedings, advance sheets, notice of meetings and postage for same	$1,862.49	
Hall rent, lunches & cigars for Club meetings	558.50	
Premium on Bonds, Secretary and Treasurer	17.50	
Stereopticon light for illustrating papers	20.00	
Office stationery and supplies	108.92	
Entertainment of members and guests	549.40	
Reporting Proceedings of meetings	120.00	
Secretary's salary and expense of advertising	816.06	
Messenger service	18.00	
Assessment Society of Technical Association Secretaries	15.00	
Contribution to Pittsburgh Y. M. C. A. Fund	200.00	
Contribution to testimonial fund for Lieut. Col. H. H. Maxfield and Captain Harry Howe (Officers of Club)	250.00	
Contribution to Red Cross Fund	500.00	
Purchase of Liberty Bonds & interest on same	2,010.03	
Total		$ 7,045.90
Balance in hands of Treasurer		$ 4,073.06

Respectfully submitted,

J. B. ANDERSON, *Secretary*

Approved:
L. H. TURNER,
D. J. REDDING,
F. R. MCFEATTERS,
A. G. MITCHELL,
F. M. MCNULTY,
Executive Committee.

VICE-PRESIDENT HOWE: We will not listen to the Annual Report of the Treasurer.

Pittsburgh, Pa., October 26, 1917.

To the Officers and Members of
The Railway Club of Pittsburgh,

GENTLEMEN:

I beg to submit the following report for the year ending October 26, 1917:

RECEIPTS

Balance on hand last year	$4,040.57	
Received from the Secretary during the year	4,991.96	
Interest on Savings account	65.16	
Interest on Checking account	21.27	
Investment in Liberty Bonds	2,000.00	
Total		$11,118.96

DISBURSEMENTS

Paid out on Secretary's vouchers	$ 7,045.90
Balance on hand, October 26, 1917	$ 4,073.06

Respectfully submitted,

F. H. STARK, *Treasurer.*

Approved:
L. H. TURNER,
D. J. REDDING,
F. R. MCFEATTERS.
A. G. MITCHELL,
F. M. MCNULTY,
Executive Committee.

VICE-PRESIDENT HOWE: The reports of the Secretary and Treasurer will be referred to the Executive Committee for approval and audit.

We will now hear the result of the elections, from Mr. D. J. Redding, of the Executive Committee.

MR. D. J. REDDING: After a very strenuous campaign and a lot of very violent opposition I have pleasure in announcing that the following gentlemen have been elected by unanimous vote to be the officers of the Club for the ensuing year:

PRESIDENT:
D. M. Howe, Railway Supplies.

FIRST VICE-PRESIDENT:
J. A. Spielmann, Asst. to General Supt. B. & O. R. R.

SECOND VICE-PRESIDENT:
L. C. Bihler, Traffic Manager, Carnegie Steel Co.

TREASURER:
F. H. Stark, General Supt., Montour R. R.

SECRETARY:
J. B. Anderson, Chief Clerk to Supt. Motive Power, P. RR.

EXECUTIVE COMMITTEE:
L. H. Turner, Supt. Motive Power, P. & L. E. R. R.
D. J. Redding, Asst. Supt. Motive Power, P. & L. E. R. R.
F. R. McFeatters, General Supt., Union R. R.
A. G. Mitchell, Superintendent, Penna. R. R.
F. M. McNulty, Supt. Motive Power, Monon. Conn. R. R.
J. G. Code.

FINANCE COMMITTEE:
Stephen C. Mason, Secretary, The McConway & Torley Co.
E. K. Conneely, Asst. to Vice-President, P. & L. E. R. R.
C. A. Lindstrom, Asst. to President, Pressed Steel Car Co.
Walter V. Turner, Manager of Engineering, Westinghouse Air Brake Co.
Frank J. Lanahan, President, Fort Pitt Malleable Iron Co.

MEMBERSHIP COMMITTEE:
A. Stucki, Engineer.
C. O. Dambach, General Manager, Unity Railways Co.

P. F. Smith, Jr., General Superintendent Motive Power, Pennsylvania Lines West.
R. L. Kleine, Chief Car Inspector, Penna. R. R.
B. E. D. Stafford, General Manager, Flannery Bolt Co.
Samuel Lynn, Master Car Builder, P. & L. E. R. R.
Harry C. Graham, President, Graham Nut Company.

ENTERTAINMENT COMMITTEE:

D. H. Amsbary, District Manager, Dearborn Chemical Co.
Harry Murdoch, President, H. Murdoch & Co.
E. C. Sattley, General Mgr. Page Woven Wire Fence Co.

SECRETARY ANDERSON: The President-elect is in a more or less embarrassing situation. He does not like to introduce himself. So I will take the liberty of introducing to you the President-elect, Mr. D. M. Howe.

MR. D. M. HOWE: Gentlemen, in the selection of myself as your President there is to me under the circumstances a great deal of sentiment connected with it. You have for the first time departed from the well-known custom of electing only railroad officials to the presidency, in choosing an ordinary business man like me I want to assure you that it is highly appreciated.

In speaking of sentiment, there is one thing I would like to ask before we go any farther, and that is to call upon the original charter members of this Club, who are present, to stand up. I mean of the original nineteen charter members.

(Messrs. A. Stucki, F. M. McNulty, D. J. Redding, L. H. Turner, F. R. McFeatters, C. H. Gale and D. C. Courtney stood in their places, and were welcomed with great applause).

I was myself one of the charter members, but not of the original nineteen.

In receiving this honor at your hands I wish further to extend my thanks and to say that I want every member of the Club to feel that he belongs to the family. We want everybody to work in co-operation. If at any time you happen to know of some capable person who is willing to read a paper before this Club, send the name to the Secretary. It is my hope to introduce an educational feature in our meetings especially for the younger men, men who perhaps would like to pattern after some of those old "nineteeners," whom we are very proud of.

One of our past presidents said at a recent meeting of the officers of the Club that I had been a kind of a chronic nominator of the presidents of this Club. I am proud of it. Look at the list of them and say if you are ashamed of them, those dear old fellows who have preceded me in this office. We are proud of them and we have a right to be.

I wish to say a word about Mr. Code. He called me up yesterday morning prior to leaving the city and told me that he had a very important engagement which would prevent him from being here tonight. He asked me to thank the membership for their splendid co-operation and kindly feeling toward him during his term of office. And I ask of you the same co-operation that you have so generously given to those who have preceded me. I believe there is nothing more than I can say at this time, other than to thank you for the honor of electing me President of this Club.

I think we ought to hear from our newly elected First Vice-President Mr. J. A. Spielmann.

MR. J. A. SPIELMANN: I feel very highly honored by this election to the First Vice-Presidency of the Club. It is the surprise of my life. I wish to assure the President that he and the Club can depend upon my complete support and co-operation. I will try to fill the office, as far as I can efficiently. I thank you very kindly for the compliment.

PRESIDENT HOWE: Mr. L. C. Bihler, Second Vice-President.

MR. L. C. BIHLER: Mr. President and members of the Railway Club: All I want to say at this time—I may have something more important to say later—is that I am very appreciative of the honor conferred upon me by this unanimous election. There was no opposition whatever. You blindly placed your faith in me, and if I ever get a chance to sit up there in the seat of the mighty as a "sub" I will do my best. I do not want to delay the program and I will only assure the members that I am very thankful to them for their kindness in electing me, and whatever work is assigned to me I will do as well as I know how.

PRESIDENT HOWE: Mr. Stark, re-elected Treasurer and the official orator of our Club.

MR. F. H. STARK: They say it takes a child three years to learn how to talk and it takes others a lifetime to learn when to stop talking. I thank you very much for the honor you have done me.

PRESIDENT HOWE: I will now introduce our re-elected chronic Secretary, Mr. J. B. Anderson.

MR. J. B. ANDERSON: You hear from me all through the year, and the expression chronic seems to be about right. At the same time I wish to impress upon the members my appreciation and thanks for their confidence in re-electing me Secretary, and to assure you that I will do my bit along with these other officers who so fully co-operate with us in the interest of our Club.

PRESIDENT HOWE: Next is Mr. Harry C. Graham, a new member of the Membership Committee.

MR. HARRY C. GRAHAM: In view of the strenuous campaign that I have recently conducted in order to be elected to this office, and by reason of the fact that I was nearly overpowered in attempting to support the orator of this Club during the strenuous speech he made a few moments ago, I feel that it is a physical impossibility to say more to you than that I appreciate the honor you have conferred upon me and I will do my best to further increase the membership of this Club. I thank you.

MR. D. F. CRAWFORD: I believe it is the custom of the Club, and a very pleasant custom, to say a few words to the retiring President and also to present to him a token of the esteem of the Club to show him that we have appreciated his efforts and energies on behalf of the Club. Unfortunately tonight we are to play Hamlet with Hamlet left out. Mr. Code, as you have just heard, has been called away from the city on imperative business, and therefore the very pleasant duty that was assigned to me, one which I would have been very much delighted to perform, of saying a few words to Mr. Code first as to what he has done for the Club and second in expressing to him my cordial personal friendship and esteem for the work I have known that he has done in our community—which is larger than our Club—must be delayed to another occasion. Mr. Code being absent from the city, the presentation, and also my speech—good news to you—will be postponed.

PRESIDENT HOWE: Is there any further business that should be brought before the Club before we take up the social program?

MR. BIHLER: This Club has not done its full duty until it further supports Uncle Sam. I move that we loan Uncle Sam one thousand dollars on the Second Liberty Loan.

The MOTION was carried by unanimous vote.

PRESIDENT HOWE: If there is no further business, the remainder of the meeting will be turned over to the Entertainment Committee, Mr. Amsbary, Chairman, who will endeavor to entertain us in a pleasant way.

MR. D. H. AMSBARY: Mr. President and members of the Club: We have no printed program tonight. The entertainment will go on in a more or less haphazard way, and we hope you will enjoy it.

A lively program of entertainment was then presented, sufficiently varied in character to appeal to the taste of a quite cosmopolitan audience, after which a standing vote of thanks was extended to the Entertainment Committee for their highly appreciated efforts.

A dainty buffet luncheon was served in the Rathskeller which was well patronized.

Adjourned at 11 o'clock P. M.

J.B. Anderson
Secretary

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS AUGUST 24, 1912,

Of Official Proceedings—The Railway Club of Pittsburgh published monthly, except June, July and August at Pittsburgh, Pennsylvania, for October 1, 1917.

County of Allegheny,
State of Pennsylvania, } *ss.*

Before me, a Notary Public in and for the State and county aforesaid, personally appeared J. B. Anderson, Secretary, who, having been duly sworn according to law, deposes and says that he is the editor and Publisher of the Official Proceedings—The Railway Club of Pittsburgh, and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 443, Postal Laws and Regulations, printed on the reverse of this form, to-wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are:

Publisher, J. B. Anderson, Secretary, 207 Pennsylvania Station, Pittsburgh, Pa.
Editor, J. B. Anderson, Secretary, 207 Pennsylvania Station, Pittsburgh, Pa.
Managing Editor, (None).
Business Managers, (None).

2. That the owners are: (Give names and addresses of individual owners, or, if a corporation, give its name and the names and addresses of stockholders owning or holding 1 per cent or more of the total amount of stock.)

The Railway Club of Pittsburgh, 207 Pennsylvania Station, Pittsburgh, Pa.; President J. G. Code, General Manager, Wabash-Pittsburgh Terminal Railway, Pittsburgh, Pa.; Secretary, J. B. Anderson, Chief Clerk to Superintendent Motive Power, Pennsylvania Railroad, Pittsburgh, Pa.; Treasurer,

F. H. Stark, General Superintendent, Montour R. R., Coraopolis, Pa.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state.)

(None)

J. B. ANDERSON,
Signature of editor, publisher.

Sworn to and subscribed before me this 29th day of September, 1917.

F. D. ECKER,
[SEAL] *Notary Public.*

My commission expires January 15, 1921.

MEMBERS

NOTE—Members on "Roll of Honor" not included in this list.

Adams, Lewis,
Clerk, P. T. C. Co.,
4004 Northminster Ave.,
N. S., Pitstburgh, Pa.

Aiken, Glen A.,
Sales Manager, American
Nut and Bolt Fastener Co.,
Ontario and Doerr Sts.,
Pittsburgh, Pa.

Ainsworth, J. H.,
Res. Inspr.,
N. Y., N. H. & H. R. R.,
903 House Bldg.,
Pittsburgh, Pa.

Alexander, J. R.,
Gen'l R. F. of E.,
Pennsylvania R. R. Co.,
Altoona, Pa.

Alleman, C. W.,
General Storekeeper,
P. & L. E. R. R. Co.,
McKees Rocks, Pa.

Allen, Jas. P.,
Vice President,
Union Steel Castings Co.,
62nd and Butler Sts.,
Pittsburgh, Pa.

Allison, John,
Chief Engineer,
Pittsburgh Steel Fdy. Co.,
Glassport, Pa.

Amend, G. F.,
Ass't. R. F. Engines,
Penna. R. R.,
Altoona, Pa.

Amsbary, D. H.,
District Manager, Dearborn
Chemical Co.,
Farmers Bank Bldg.,
Pittsburgh, Pa.

Anderson, A. E.,
President and Counsel,
Pgr. Dist. R. R. Co.,
420 Bessemer Bldg.,
Pittsburgh, Pa.

Anderson, D. W.,
Manager,
Railway-Steel Spring Co.,
20th and Liberty Sts.,
Pittsburgh, Pa.

Anderson, G. S.,
Electrician, P. R. R.,
Box 22, Penna. Sta.,
Pittsburgh, Pa.

Anderson, J. B.,
C. C. to S. M. P.,
P. R. R. Co.,
207 Penna. Station,
Pittsburgh, Pa.

Anderson, J. P.,
Chief Draftsman,
P. S. Car Co.,
Farmers Bank Bldg.,
Pittsburgh, Pa.

Antes, Edwin L.,
Foreman Elect. Dept.,
Pressed Steel Car Co.,
McKees Rocks, Pa.

Anthony, J. T.,
Assistant to President,
American Arch Co.,
30 Church St.,
New York, N. Y.

Arensberg, F. L.,
President,
Vesuvius Crucible Co.,
Box 47,
Swissvale, Pa.

Armstrong, J. C.,
Acting Train Master,
Penna. R. R.,
3000 Sarah St.,
Pittsburgh, Pa.

Armstrong, J. L.,
Foreman Power Plants,
Penna. Lines,
1241 Columbus Ave.,
N. S., Pittsburgh, Pa.

Arnold, J. G.,
Car Service Clerk,
Montour R. R.,
8 Market St.,
Pittsburgh, Pa.

Arnold, J. J.,
Sales Dept., P. S. C. Co.,
Farmers Bank Bldg.,
Pittsburgh, Pa.

Ayers, H. B.,
Gen. Mgr., H. K. Porter Co.,
49th St. and A. V. Ry.,
Pittsburgh, Pa.

Ayres, W. C.,
Foreman Car Dept.,
P. C. C. & St. L. Ry.,
114 Railroad Ave.,
Carnegie, Pa.

Babcock, F. H.,
Safety Agent,
P. & L. E. R. R.,
54 Terminal Annex,
Pittsburgh, Pa.

Bailey, R. E. L.,
Sec'y., American Spiral
Spring and Mfg. Co.,
50th and Butler Sts.,
Pittsburgh, Pa.

Baird, F. C.,
Freight Traffic Manager,
B. & L. E. R. R.,
Room 618 Frick Bldg.,
Pittsburgh, Pa.

Baker, J. H.,
Clerk, M. P. Dept.,
P. R. R. Co.,
207 Penna. Station,
Pittsburgh, Pa.

Bakewell, Donald C.,
Assistant Treasurer,
Duquesne Steel Fdy. Co.,
Arrott Building,
Pittsburgh, Pa.

Ball, Geo. L.,
Treasurer,
Ball Chemical Co.,
230 S. Fairmont Ave.,
Pittsburgh, Pa.

Ball, Wendell P.,
Asst. Engr. M. W. Dept.,
11 So. Wilkinson St.,
Dayton, O.

Barber, J. W.,
Gen'l. Mgr. Docks and Mills,
Pittsburgh Coal Co.,
8 Market St.,
Pittsburgh, Pa.

Barker, A. E.,
Salesman,
Firth-Sterling Steel Co.,
1422 Oliver Building,
Pittsburgh, Pa.

Barnett, Geo.,
Special Rep.,
W. W. Lawrence & Co.,
Pittsburgh, Pa.

Barney, Harry,
Secretary and Treasurer,
Laughlin-Barney Mach. Co.,
Union Arcade,
Pittsburgh, Pa.

Barth, John W.,
Hartman Farm,
12th Ward,
Pittsburgh, Pa.

Bartley, Milton,
Pres., aBrtley Automatic
Nut & Bolt Fastener Co.,
P. O. Box 802,
Pittsburgh, Pa.

Basford, G. M.,
President, Locomotive Feed
Water Heater Co.,
30 Church St.,
New York, N. Y.

Batchelar, E. C.,
Manager, The Motch &
Merryweather Mach'y Co.,
Farmers Bank Bldg.,
Pittsburgh, Pa.

Bateman, W. H. S.,
Sales Agent,
Parkersburg Iron Co.,
822 Commercial
Trust Building,
Philadelphia, Pa.

Battenhouse, John,
Inspector, W. A. B. Co.,
670 A Middle Ave.,
Wilmerding, Pa.

Batty, John,
Boiler Inspector,
Fidelity and Casualty Co.,
11 Buffalo St.,
Oakland, Pittsburgh, Pa.

Bauer, A. C.,
Ass't. Engine House Foreman, P. R. R. Co.,
228 N. Rebecca St.,
Pittsburgh, Pa.

Bayley, H. P.,
Ass't. Gen'l. Manager,
The Buda Co.,
Railway Exchange,
Chicago, Ill.

Bean, Wm. H.,
Insp'r. Loco. Dept.,
Carnegie Steel Co.,
305 Third Ave.,
Homestead, Pa.

Beatty, E. G.,
Rep. Galena Signal Oil Co.,
P. O. Box 691,
Franklin, Pa.

Beegel, F. W.,
Chief Clerk,
Union Steel Casting Co.,
62nd and Butler Sts.,
Pittsburgh, Pa.

Bell, R. P.,
Chief Clerk to M. C. B.,
P. & L. E. R. R.,
McKees Rocks, Pa.

Bellows, A. B.,
Vice Pres't., Pittsburgh
Testing Laboratory,
7th and Bedford Aves.,
Pittsburgh, Pa.

Beltz, John D.,
Train Master, B. & O. R. R.,
Wellington Apts.,
Mt. Washington,
Pittsburgh, Pa.

Bennett, Byard W.,
Treasurer,
Standard Tin Plate Co.,
Canonsburg, Pa.

Berg, Karl,
Draftsman, P. & L. E. R. R.,
6563 Apple Ave.,
Pittsburgh, Pa.

Berghane A. L.,
Mechanical Expert,
Westinghouse Air Brake Co.,
200 Westinghouse Bldg.,
Pittsburgh, Pa.

Bernard, R. Y.,
Railway Supplies,
Land Title Bldg.,
Philadelphia, Pa.

Beswick, John,
Ass't. Road Foreman of
Engines, P. R. R. Co.,
2424 Beale Ave.,
Altoona, Pa.

Bihler, L. C.,
Traffic Manager,
Carnegie Steel Co.,
Room 814 Carnegie Bldg.,
Pittsburgh, Pa.

Blackall, Robert H.,
504 Transit Bldg.,
No. 7 East 42nd St.,
New York, N. Y.

Blair, Harry A.,
Div. M. C. B.,
B. & O. R. R.,
304 Renova St.,
Pittsburgh, Pa.

Blakley, T. M.,
R. F. of E., Penna. R. R.,
Penna. Lines Bldg.,
Pittsburgh, Pa.

Bloom, Chas. W.,
330 Russelwood Ave.,
McKees Rocks, Pa.

Bole, Robert A.,
Manager, Manning,
Maxwell & Moore,
Room 1005, Park Bldg.,
Pittsburgh, Pa.

Bond, W. W.,
Asst. Road Foreman of Engines, P. R. R. Co.,
5447 Kincaid St.,
Pittsburgh, Pa.

Boring, T. J.,
General Foreman,
M. C. B. Clearing House,
P. R. R.,
Altoona, Pa.

Booth, J. K.,
General Foreman,
B. & L. E. R. R.,
No. 8 Penn Ave.,
Greenville, Pa.

Bosley, N. D.,
Machinist, P. & L. E. R. R.,
650 Broadway, West Park,
McKees Rocks, Pa.

Botsford, Clarence F.,
226 E. Eighth Ave.,
Homestead, Pa.

Bottomly, E. S.,
Chief Joint Inspector,
P. & R. and C. V. Rys.,
Martinsburg, W. Va.

Bowden, T. C.,
Coal Inspector,
B. & L. E. R. R.,
Greenville, Pa.

Boyd, D. R.,
Civil Eng'r., P. R. R.,
c. o. Master Carpenter,
Aspinwall, Pa.

Boyer, Chas. E.,
General Car Inspector,
P. R. R. Co.,
Room 204 Penna. Sta.,
Pittsburgh, Pa.

Boyer, John B.,
Loading Expert, Bridge Dept.,
Bethlehem Steel Co.,
Steelton, Pa.

Bradley, W. C.,
Clerk, Union R. R.,
429 Price Ave.,
N. Braddock, Pa.

Brady, Daniel M.,
President, Brady Brass Co.,
95 Liberty St.,
New York, N. Y.

Brady, T. J.,
Train Master, B. & O. R. R.,
Wellington Apts.,
Mt. Washington,
Pittsburgh, Pa.

Brandt, W. L.,
Machinist, P. R. R.,
406 Charles St.,
Knoxville, Pa.

Branson, Craig R.,
302 West Berry St.,
Fort Wayne, Ind.

Brashear, Dr. John A.,
1954 Perrysville Ave.,
N. S., Pittsburgh, Pa.

Braun, W. S.,
Superintendent Coal Docks,
Union R. R.,
Duquesne, Pa.

Braun, Otto,
Assistant Foreman,
Machine Shop,
P. & L. E. R. R.,
McKees Rocks, Pa.

Brenan, E. J.,
General Master Mechanic,
306 B. & O. Station,
Pittsburgh, Pa.

Bretz, F. K.,
General Manager, Morgantown and Kingwood R. R.,
Morgantown, W. Va.

Brewer, Wm. A.,
Mechanical Engineer,
Standard Ry. Equip. Co.,
New Kensington, Pa.

Brewster, Morris B.,
Rep., The U. S. Metallic Packing Co.,
454 Railway Exchange Building,
Chicago, Ill.

Brinser, C. E.,
Div. Engr., P. R. R.,
West Philada, Pa.

Brock, Jesse,
Foreman Car Dept.,
P. C. C. & St. L. Ry.,
Carnegie, Pa.

Broome, S. P.,
Rep. A. M. Byers Co.,
235 Water St.,
Pittsburgh, Pa.

Broseman, W.,
320 N. Washington St.,
Butler, Pa.

Brower, R. M.,
29 Claremont Ave.,
New York, N. Y.

Brown, A. D.,
General Superintendent,
P. & L. E. R. R. Co.,
General Office,
Pittsburgh, Pa.

Brown, E. C.,
Chief Civil Engineer,
Carnegie Steel Co.,
Room 1122,
Carnegie Building,
Pittsburgh, Pa.

Brown, F. W.,
Treasurer,
Central Ry. Signal Co.,
Columbia Bank Bldg.,
Pittsburgh, Pa.

Brown, James,
Manager, Watson Paint
& Glass Co.,
101 W. Ohio St.,
N. S., Pittsburgh, Pa.

Brown, J. Alexander,
Vice President and Manager,
The Railway Equipment
& Publication Co.,
75 Church St.,
15th Floor,
New York, N. Y.

Brown, John T., Jr.,
Supt. Duquesne Reduction Co.,
Gross and Yew Sts.,
Pittsburgh, Pa.

Brown, W. C.,
Rep. Monon. Lumber Co.,
715 House Bldg.,
Pittsburgh, Pa.

Brunner, F. J.,
Auditor, Wabash Pgh. T. Ry.,
521 Wabash Bldg.,
Pittsburgh, Pa.

Buck Leo,
Loco. Fireman, Union R. R.,
209 Fifth Ave.,
Homestead, Pa.

Buckbee, W. A.,
Singerlands, N. Y.

Buechner, W. A.,
District Manager,
E. F. Houghton & Co.,
501 Manufacturers Bldg.,
Pittsburgh, Pa.

Buell, D. C.,
Director, the Railway Educational Bureau, ,
Union Pac. Headquarters,
Omaha, Neb.

Buffington, W. P.,
C. C. to Vice President,
Montour R. R.,
1024 Oliver Bldg.,
Pittsburgh, Pa.

Burket, C. W.,
Ass't. Master Mechanic,
P. R. R. Co.,
32nd and Carson Sts.,
S. S., Pittsburgh, Pa.

Burns, J. D.,
Rep., Crucible Steel Co.,
Empire Building,
Pittsburgh, Pa.

Burry, V. J.,
Mechanical Engineer,
Joliet Ry. Supply Co.,
Chicago, Ill.

Burson, H. W.,
c. o. Burson Supply Co.,
Pittsburgh, Pa.

Burley, J. B.,
Rep., Jas. Lappan Mfg. Co.,
20th and Pike Sts.,
Pittsburgh, Pa.

Cahill, M. H.,
Gen'l. Supt., B. & O. R. R.,
Water St. Station,
Pittsburgh, Pa.

Cain, Clyde C.,
Chief Clerk,
Firth-Sterling Steel Co.,
1422 Oliver Bldg.,
Pittsburgh, Pa.

Caine, C. D.,
Foreman, P. R. R.,
439 Shady Ave.,
Pittsburgh, Pa.

Calvert, H. W.,
Round House Foreman,
P. & L. E. R. R.,
305 Second St.,
Mahoningtown, Pa.

Calvin, A. W.,
Draftsman, A. Stucki Co.,
305 Jackson St.,
N. S., Pittsburgh, Pa.

Campbell, Argyle,
President,
Enterprise Ry. Equip. Co.,
1153 Rookery Bldg.,
Chicago, Ill.

Campbell, I. K.,
6428 Darlington Road,
Pittsburgh, Pa.

Cardwell, J. R.,
Pres., Union Draft Gear Co.,
1763 McCormick Bldg.,
Chicago, Ill.

Carpenter, Harry L.,
Central States Rep.,
Ajax Metal Co.,
4048 Jenkins Arcade,
Pittsburgh, Pa.

Carr, T. W.,
Drawing Instructor,
P. & L. E. R. R.,
McKees Rocks, Pa.

Carroll, Frank E.,
Ass't. Foreman W. & B. Co.,
Grey Hall Apts.,
Irwin, Pa.

Carson, G. E.,
Div. Master Car Builder,
N. Y. C. R. R. Co.,
W. Albany, N. Y.

Cartwright, Wm. E.,
Salesman,
Damascus Bronze Co.,
928 South Ave.,
N. S., Pittsburgh, Pa.

Casey, P. H.,
C. C., Pressed S. C. Co.,
639 Shade St.,
Bellevue, Pa.

Cassiday, C. R.,
Chief Clerk, W. P. T. Ry.,
419 Wabash Bldg.,
Pittsburgh, Pa.

Casterline, Charles,
Freight Agent, P. R. R.,
No. 1 Third St.,
Sharpsburg, Pa.

Caton, S. W.,
Master Car Builder,
W. M. R. R.,
Hagerstown, Md.

Chamberlain, W. A.,
Auditor, P. S. C. Co.,
Farmers Bank Bldg.,
Pittsburgh, Pa.

Chester, Chas. J.,
Gen. Stay Bolt Insp'r.,
Penna. R. R. Co.,
7040 Penn Ave.,
Pittsburgh, Pa.

Chilcoat, H. E.,
Rep., Westinghouse Air
Brake Co.,
200 Westinghouse Bldg.,
Pittsburgh, Pa.

Christfield, J. G.,
Mechanical Engineer,
Forged Steel Wheel Co.,
Butler, Pa.

Chittenden, A. D.,
Ass't. to General Manager,
B. & L. E. R. R.,
Room 1013,
Carnegie Bldg.,
Pittsburgh, Pa.

Christianson, A.,
Chief Engineer,
Standard Steel Car Co.,
Butler, Pa.

Christy, F. .,
Enginehouse Foreman,
P. R. R.,
4406 Butler St.,
Pittsburgh, Pa.

Christy, O. B.,
Ass't. R. F. of Engines,
B. & L. E. R. R.,
27 Columbia Ave.,
Greenville, Pa.

Chrystal, W. A.,
Bookkeeper, Montour R. R.,
8 Market St.,
Pittsburgh, Pa.

Clark, C. C.,
Sales Agent,
Pressed Steel Car Co.,
Room 1910,
Farmers Bank Bldg.,
Pittsburgh, Pa.

Clark, Chas. H.,
President, Clark Car Co.,
1639 Oliver Bldg.,
Pittsburgh, Pa.

Cline, W. A.,
Ass't. Supt. Transportation
and Labor,
Carnegie Steel Co.,
713 10th Ave.,
Munhall, Pa.

Cocayne, W. H.,
Eng'r. Carnegie Steel Co.,
114 West Eighth Ave.,
Homestead, Pa.

Code, J. G.,
1318 Sheridan Ave.,
Pittsburgh, Pa.

Coe, C. W.,
Superintendent,
W. & L. E. R. R.,
Brewster, O.

Coffin, J. S.,
Chairman, Franklin Ry.
Supply Co.,
30 Church St.,
New York City, N. Y.

Coffin, W. E.,
Con. Engr., National
Malleable Castings Co.,
7706 Platt Ave.,
Cleveland, O.

Collins, C. R.,
Clerk, P. R. R.,
Penna. Station,
Pittsburgh, Pa.

Conneeley, E. K.,
Ass't. to Vice President,
P. & L. E. R. R. Co.,
General Office,
Pittsburgh, Pa.

Conner, W. P.,
Efficiency Inspr., P. R. R.,
429 Second St.,
Monongahela City, Pa.

Converse, Paul D.,
Instructor Commerce,
University of Pittsburgh,
Grant Boulevard,
Pittsburgh, Pa

Conway, J. D.,
Sec. & Treas. Railway Supply
Manufacturer's Association,
2136 Oliver Bldg.,
Pittsburgh, Pa.

Conwell, F. E.,
M. P. Insp., Pena. Lines,
Pittsburgh, Pa.

Cook, C. C.,
District Engr., M. of W.,
B. & O. R. R.,
Wheeling, W. Va.

Cooper, F. E.,
B. & O. Shops,
Newark, Ohio.

Cooper, Wm. M.,
Draftsman, P. S. C. Co.,
35 S. Howard St.,
Bellevue, Pa.

Cooper, J. H.,
Rep., Dearborn Chemical Co.,
McCormick Bldg.,
Chicago, Ill.

Copeland, T. T.,
Road Foreman Eng's.,
Carnegie Steel Co.,
Munhall, Pa.

Cornelius, R. D.,
Assistant Foreman,
Pressed S. C. Co.,
710 Russellwood Ave.,
McKees Rocks, Pa.

Cotton, A. C.,
Instructor, P. R. R.,
26th St. Bldg.,
Pittsburgh, Pa.

Condit, E. A., Jr.,
Sales Mgr., Rail Joint Co.,
2245 Oliver Bldg.,
Pittsburgh, Pa.

Coulter, A. F.,
G. C. F., Union R. R. Co.,
East Pittsburgh, Pa.

Courson, Chas. L.,
Fore. Car Inspectors,
P. R. R. Co.,
Pitcairn, Pa.

Courson, J. F.,
General Foreman,
Penna. R. R. Co.,
Pitcairn, Pa.

Courtney, D. C.,
Mechanical Expert,
1130 Sheffield St.,
N. S., Pittsburgh, Pa.

Cox, A. J.,
Master Mechanic,
LaBelle Iron Works,
Steubenville, Ohio.

Cox, Edward M.,
Rep. Cox Bros.,
Andrew St. and 14th Ave.,
Munhall, Pa.

Cox, Thos. M.,
Insp'r. Carnegie Steel Co.,
166 Steuben Ave.,
Crafton, Pa.

Craig, E. A.,
South Eastern Manager,
Westinghouse Air
Brake Co.,
200 Westinghouse Bldg.,
Pittsburgh, Pa.

Crawford, D. F.,
General Manager,
Pennsylvania Lines West,
Pittsburgh, Pa.

Crenner, Jos. A.,
Rep. Dearborn Chemical Co.,
1623 Farmers Bank Bldg.,
Pittsburgh, Pa.

Critchlow, John N.,
Supt. of Inspection,
Crucible Steel Co.,
Midland, Pa.

Croft, Elliot P.,
Engineman, Penna. Co.,
8 Eloise St.,
N. S., Pittsburgh, Pa.

Crouch, A. W.,
Vice-President & Gen'l Mgr.
Dearborn Chemical Co.,
2454-64 Dundas St. W.,
Toronto, Canada.

Culen, James K.,
President,
The Niles Tool Works Co.,
Hamilton, Ohio.

Cunningham, J. L.,
Supt. M. P., P. R. R.,
207 Penna. Station,
Pittsburgh, Pa.

Cunningham, R. I.,
Mechanical Expert,
W. A. B. Co.,
436 Franklin Ave.,
Wilkinsburg, Pa.

Cunningham, W. P.,
Master Mechanic,
Winfield R. R.,
West Winfield, Pa.

Currie, J. C.,
Special Representative,
Nathan Mfg. Co.,
P. O. Box 35,
Flushing, N. Y.

Curtin, J. J.,
Work Insp. M. C. B.,
P. C. C. & St. L. Ry.,
207 Corliss St.,
Pitsburgh, Pa.

Daley, John P.,
Rep. Daley Bros.,
803 Amity St.,
Homestead, Pa.

Dalton, C. R.,
Enginehouse Foreman,
East Brady, Pa.

Daly, P. J.,
Gang Foreman, Car Dept.,
P. C. C. & St. L. Ry.,
500 W. Carson St.,
Pittsburgh, Pa.

Dambach, C. O.,
General Manager,
Unity Rys. Co.,
Union Arcade,
Pittsburgh, Pa.

Danforth, G. H.,
Structural Engr.,
J. & L. S. Co.,
3rd Ave. and Ross St.,
Pittsburgh, Pa.

Dashiell, J. W.,
F. & T. Agent,
B. & O. R. R.,
Glenwood Station,
Pittsburgh, Pa.

Davis, A. G.,
Secretary and Auditor,
P. A. & McK. R. R.,
McKees Rocks, Pa.

Davis, H. J.,
Superintendent,
St. Clair Terminal R. R.,
Clairton, Allegh. Co., Pa.

Deane, Robert,
Chief Clerk, B. & O. R. R.,
4911 Second Ave.,
Pittsburgh, Pa.

DeArment, John H.,
Foreman, Blacksmith Shop,
P. R. R. Co.,
P. O. Box 284,
Pitcairn, Pa.

Deckman, E. J.,
Mfg's. Agent,
1417 Oliver Bldg.,
Pittsburgh, Pa.

Deem, G. M.,
Car Inspector, P. R. R.,
6-8 Superior St.,
Duquesne, Pa.

DeLaney, V. W.,
Superintendent,
Youngstown Steel &
Tube Co.,
Youngstown, Ohio.

DeReymer, C. A.,
Eingineman, B. & O. R. R.,
613 Newell Ave.,
New Castle, Pa.

DeRemer, W. L.,
V. Pres., Spencer Otis Co.,
2464 Diana St.,
Chicago, Ill.

DeVore, Harry T.,
Ass't. Gen'l. Foreman,
Car Shop, P. & L. E. R. R.,
1234 Resaca Place,
N. S., Pittsburgh, Pa.

De Zafra, Carlos,
Naval Constructor,
Foundation Co.,
Woolworth Bldg.,
New York, N. Y.

Dice, Nrban E.,
Foreign Adv. Mgr.,
Gazette-Telegraph,
Gazette Square,
Pittsburgh, Pa.

Dickinson, F. W.,
M. C. B.,
B. & L. E. R. R. Co.,
Greenville, Pa.

Dodds, Ethan L.,
Rep. Flannery Bolt Co.,
Vanadium Bldg.,
Pittsburgh, Pa.

Donahue, C. L.,
Ass't. to Vice President,
American Loco. Co.,
530 Riverside Drive,
New York, N. Y.

Donaldson, D. B.,
Traffic Manager,
B. Nicoll & Co.,
807 Wabash Bldg.,
Pittsburgh, Pa.

Donaldson, G. C.,
Draftsman, P. T. C. Co.,
Allison Ave.,
Emsworth, Pa.

Donaldson, W. E.,
467 Frick Annex,
Pittsburgh, Pa.

Dorr, Charles O.,
Chief Clerk,
Monongahela R. R. Co.,
Brownsville, Pa.

Doty, W. H.,
Air Brake Instructor,
P. R. R. Co.,
Pitcairn, Pa.

Douglass, W. N.,
Gang Foreman, Car Dept.,
P. C. C. & St. L. Ry.,
117 Railroad Ave.,
Carnegie, Pa.

Downing, I. S.,
Master Car Builder,
P. C. C. & St. L. R. R.,
Indianapolis, Ind.

Draper, Thos.,
Manager, Draper Mfg. Co.,
Port Huron, Mich.

Drayer, U. S.,
Draftsman, P. R. R. Co.,
Altoona, Pa.

DuBarry, E. G.,
Mechanical Engineer,
W. P. Ter. Ry.,
5860 Marlborough St.,
Pittsburgh, Pa.

Dudley, S. W.,
Chief Engineer,
W. A. B. Co.,
Wilmerding, Pa.

Duff, Samuel E.,
Consulting Engineer,
704 Empire Bldg.,
Pittsburgh, Pa.

Duffy, John F.,
Correspondent,
The Daily Metal Reporter,
First Nat'l. Bank Bldg.,
Pittsburgh, Pa.

Dunham, F. C.,
Assistant to President,
National Ry. Appliance Co.,
50 East 42nd St.,
New York, N. Y.

Dunn, Samuel O.,
Editor, Railway Age Gazette,
608 So. Dearborn St.,
Chicago, Ill.

Durant, C. H.,
Assistant Chief Clerk,
B. & O. R. R.,
135 Hazelwood Ave.,
Pittsburgh, Pa.

Durham, Geo.,
Supt. Motive Power,
W. & L. E. Ry.,
Brewster, Ohio.

Durkin, Jas. E.,
Foreman,
Ft. Pitt Mall. Iron Co.,
812 Thompson Ave.,
McKees Rocks, Pa.

Dussel, F. E.,
Secretary and Treasurer,
Transue & Williams Co.,
Alliance, Ohio.

Early, G. G.,
Ass't. Gen'l. Frt. Agent,
W. P. Ter. Ry.,
Wabash Bldg.,
Pittsburgh, Pa.

Easter, Dr. D. M.,
Medical Examiner,
P. R. R. Co.,
218 W. Otterman St.,
Greensburg, Pa.

Edmunds, Frank W.
Sales Manager, The Dressel
Railway Lamps Works,
3868 Park Ave.,
New York, N. Y.

Edwards, G. H.,
Dist. Supt. Pullman Co.,
1013 Penn Ave.,
Pittsburgh, Pa.

Eichenberger, J. J.,
Freight Agent, Penna. Co.,
North and Irwin Aves.,
Allegheny, Pa.

Eichenlaub, W. C.,
Secretary,
Union Steel Casting Co.,
62nd St. & A. V. Ry.,
Pittsburgh, Pa.

Elder, C. K.,
Auditor, Monon Ry. Co.,
Box 558,
Brownsville, Pa.

Elk, Geo. R.,
Ass't. Train Master P. R. R.,
660 Evergreen Ave.,
Millvale, Pa.

Elkin, W. C.,
P. W. Inspr., P. R. R.,
368 Second St.,
Pitcairn, Pa.

Elliot, A. H.,
Representing,
American Brake Shoe and
Foundry Co., Room 1335,
Real Estate Trust Bldg.,
Philadelphia, Pa.

Elliott, M. W.,
Manager, Consumers Oil Co.,
1016 Constance St.,
N. S., Pittsburgh, Pa.

Elmer, Wm.,
Supt. P. R. R.,
Reading, Pa.

Elsey, W. R.,
Draftsman, P. R. R.,
4730 Blair St.,
Pittsburgh, Pa.

Elverson, H. W.,
General Foreman,
Misc. Order Dept.,
Pressed Steel Car Co.,
Pittsburgh, Pa.

Emery, E.,
Railway Supplies,
1305 Farmers Bank Bldg.,
Pittsburgh, Pa.

Emery, R. W.,
Draftsman,
Simplex A. B. & Mfg. Co.,
36 East Forrest St.,
Bellevue, Pa.

Emmons, G. C.,
Sales Engineer,
Chicago Pneumatic Tool Co.,
10-12 Wood St.,
Pittsburgh, Pa.

Endsley, Louis E.,
Prof. of Ry. Mechanical
Engineering, U. of P.,
Bigelow Boulevard,
Pittsburgh, Pa.

England, Alexander,
Ass't. Chief Engineer,
W. A. B. Co.,
428 Biddle Ave.,
Wilkinsburg, Pa.

Evans, Evan,
Loco. Engr. Union R. R.,
111 Camp Ave.,
Braddock, Pa.

Ewald, Wm.,
Supt. Motive Power,
C. & P. R. R.,
Mt. Savage, Md.

Ewing, G. L.,
G. L. Ewing & Bro.,
Homestead, Pa.

Farquhar, L. C.,
Engineer, Allegheny Steel Co.,
2332 Oliver Bldg.,
Pittsburgh, Pa.

Fay, Frank L.,
President,
Greenville Steel Car Co.,
Greenville, Pa.

Fendner, W. J.,
Engineer, Clark Car Co.,
1639 Oliver Bldg.,
Pittsburgh, Pa.

Ferguson, O. G.,
Supt. Trans.,
Monon Conn. R. R.,
4166 Second Ave.,
Pittsburgh, Pa.

Ferren, Robert O.,
Locomotive Engineer,
Penna. R. R. Co.,
1233 Franklin St.,
Wilkinsburg, Pa.

Fettinger, H. O.,
Rep., Ashton Valve Co.,
128 Liberty St.,
New York, N. Y.

Field, Arthur W.,
General Sales Agent,
Standard Motor Truck Co.,
1120 Frick Bldg.,
Pittsburgh, Pa.

Field, Frank R.,
District Manager,
Bird-Archer Co.,
1503 1st Nat'l Bank Bldg.,
Pittsburgh, Pa.

Fields Alfred C.,
Clerk, P. S. C. Co.,
McKees Rocks, Pa.

Fields, D. S.,
Foreman Car Dept.,
P. & L. E. R. R.,
2011 Fourth Ave.,
Beaver Falls, Pa.

Fitzgerald, D. W.,
Assistant Foreman,
Machine Shop,
Penna. Lines,
1600 Commerce St.,
Wellsville, Ohio.

Flaherty, P. J.,
General Manager,
Johnson Bronze Co.,
New Castle, Pa.

Flannery, Jas. J.,
Prest., Flannery Bolt Co.,
Vanadium Bldg.,
Pittsburgh, Pa.

Flannery, J. Rogers,
Vice Pres. Flannery Bolt Co.,
Vanadium Bldg.,
Pittsburgh, Pa.

Fleharty, J. H.,
Salesman, Jos. T.
Ryerson & Son,
Western Reserve Bldg.,
Cleveland, Ohio.

Fleming, H. L.,
General Foreman,
B. & O. R. R.,
328 Renova St.,
Pittsburgh, Pa.

Flinn, R. H.,
Ass't. Master Mechanic,
Penna. Lines West,
N S., Pittsburgh, Pa.

Flinner, John,
Insp. A. B., P. & L. E. R. R.,
740 Frederick St.,
McKees Rocks, Pa.

Fluent, B. F.,
Eng. Dispatcher,
B. & L. E. R. R.,
Box 42,
N. Bessemer, Pa.

Foller, Chas. S.,
Mgr. Sales, Union
Spring and Mfg. Co.,
First Natl. Bank Bldg.,
Pittsburgh, Pa.

Follet, Louis,
President,
Standard Tin Plate Co.,
Canonsburg, Pa.

Forrest, C. H.,
Foreman, P. & L. E. R. R.,
503 Bulcan St.,
McKees Rocks, Pa.

Forsythe, Geo. B.,
Ass't. Foreman, Car Dept.,
Penna. Co.,
P. O. Box 95,
Conway, Pa.

Foster, John S.,
Engineer,
W. & L. E. R. R.,
Massillon, Ohio.

Frame, R. S., Jr.,
Gen'l. Mgr. and Chief Engr.,
M. & L. R. R. Co.,
Old Washington, Ohio.

Francis, W. T.,
Rep., Chicago Pneumatic
Tool Co.,
10-12 Wood St.,
Pittsburgh, Pa.

Frasher, John D.,
Insp., Pressed S. C. Co.,
613 Arch St.,
N. S., Pittsburgh, Pa.

Freshwater, F. H.,
Chief Draughtsman,
Pressed Steel Car Co.,
McKees Rocks, Pa.

Frey, A. R.,
Draughtsman,
Pressed Steel Car Co.,
3458 Fleming Ave.,
N. S., Pittsburgh, Pa.

Frost, Harry W.,
President. The Frost
Railway Supply Co.,
1048 Nenobscot Bldg.,
Detroit, Mich.

Fuller, S. R., Jr.,
120 Broadway,
New York, N. Y.

Fulton. A. M.,
Asst. Supt., Fort Pitt
Mallable Iron Co.,
727 George St.,
Coraopolis, Pa.

Funk, Sterling R.,
Rep., Jenkins Bros.,
3537 North 19th St.,
Philadelphia, Pa.

Gaither, Alonzo.
Locomotive Engineer,
Carnegie Steel Co.,
Hays, Pa.

Gale, C. H.,
Supt. Foundries,
Pressed Steel Car Co.,
McKees Rocks, Pa.

Gallinger, Geo. A.,
Manager, Pneumatic Tool
Sales, Ingersoll-Rand Co.,
11 Broadway,
New York, N. Y.

Gano, J. H.,
Supt. and M. C. B.,
Aliq. & Southern Ry.,
Woodlawn, Pa.

Garland, W. L.,
Mgr., S. C. H. & L. Co.,
501 Commercial Trust Bldg.,
Philadelphia, Pa.

Gearhart, H. J.,
Purchasing Agent,
Pressed Steel Car Co.,
Farmers Bank Bldg.,
Pittsburgh, Pa.

Gearhart, J. A.,
Secretary and Treasurer,
Gulick-Henderson Co.,
525 Third Ave.,
Pittsburgh, Pa.

Geary, J. J.,
Homestead Gas &
Electric Co.,
Eighth Ave.,
Homestead, Pa.

Geisler, Jos. J.,
Foundry Foreman,
Ft. Pitt Mall. Iron Co.,
1453 Orator St.,
Pittsburgh, Pa.

Gellinger, Chas. W.,
Rep. Independent Pneumatic Tool Co.,
1208 Farmers Bank Bldg.,
Pittsburgh, Pa.

George. M. E.,
Car Foreman.
Union R. R. Co.,
Port Perry, Pa.

Germain, L., Jr.,
Pres't. Germain Lumber Co.,
Farmers Bank Bldg.,
Pittsburgh, Pa.

Gibson, Frank,
C. C. to Gen'l. Supt.,
Union R. R. Co.,
423 Ross Ave.,
Wilkinsburg, Pa.

Gibson, Wm. S.,
Eng'r., M. of W.,
Union R. R. Co.,
831 Holland Ave.,
Wilkinsburg, Pa.

Gies, Geo. F.,
General Foreman,
Pennsylvania Company,
1534 Garfield Ave.,
N. S., Pittsburgh, Pa.

Gildroy, Geo. J.,
193 N. Laurel St.,
Hazelton, Pa.

Giles, Alfred,
Master Mechanic,
Carnegie Steel Co.,
1823 Main St.,
Sharpsburg, Pa.

Gilg, Henry F.,
Salesman,
Penn I. & S. Co.,
P. O. Box 190,
N. S., Pittsburgh, Pa.

Gillespie, John M.,
G. S. A., Lockhart Iron &
Steel Company,
Pittsburgh, Pa.

Gillespie, Wm. J.,
Boiler Inspector,
P. & L. E. R. R.,
1127 Charles St.,
McKees Rocks, Pa.

Glass, H. M.,
Foreman, Penn. R. R. Co.,
Phillipston, Pa.

Glassburn, S. G.,
Ass't. Road Foreman of
Engines, P. R. R. Co.,
Conemaugh, Pa.

Gold, Egbert H.,
Pres. Chicago Car Heating Co.,
Railway Exchange Bldg.,
Chicago, Ill.

Goldfinch, R.,
Inspector, Pittsburgh
Testing Laboratory,
815 Russellwood Ave.,
McKees Rocks, Pa.

Goodwillie, E. E.,
Salesman, ,
Bethlehem Steel Co.,
First Nat'l. Bank Bldg.,
Pittsburgh, Pa.

Gowdy, H. K.,
Supt. Power Stations.
Pgh. Railways Co.,
235 Charles St.,
Mt. Oliver Station,
Pittsburgh, Pa.

Grafton, N. M.,
Railway Electrician,
Pittsburgh Railways Co.,
46 Greenbush St.,
Mt. Washington Sta.,
Pittsburgh, Pa.

Graham, Chas. J.,
Vice President,
Graham Nut Co.,
1317 West Carson St.,
Pittsburgh, Pa.

Graham, E. A.,
Steam Engr.,
Carnegie Steel Co.,
Sharpsburg, Pa.

Graham, Harry C.,
President, Graham Nut Co.,
1608 State Ave.,
Coraopolis, Pa.

Graham, H. E.,
General Freight Agent,
Pressed Steel Car Co.,
Pittsburgh, Pa.

Graham, Russell,
Draftsman, P. S. C. Co.,
99 Grant Ave.,
Bellevue, Pa.

Grantier, L. V.,
Motive Power Inspr.,
B. & O. R. R.,
1008 House Bldg.,
Pittsburgh, Pa.

Gray, C. B.,
Master Mechanic, P. R. R.,
32d & Carson Sts.,
S. S., Pittsburgh, Pa.

Gray, G. D.,
Signal Inspector,
Penna. Lines West,
Room 821, Penna. Sta.,
Pittsburgh, Pa.

Gray, Guy M.,
S. M. P.,
B. & L. E. R. R. Co.,
Greenville, Pa.

Gray, Thos. H.,
Conductor, P. R. R.,
352 College Ave.,
Oakmont, Pa.

Gray, T. H.,
Master Carpenter, P. R. R.,
Cor. Eastern and Freeport,
Aspinwall,
Pittsburgh, Pa.

Grayble, R. A.,
Clerk, P. & L. E. R. R.,
218 Sagamore St.,
Pittsburgh, Pa.

Green, A. Roy,
Pgh Rep. Standard
Steel Works Co.,
1416 Oliver Bldg.,
Pittsburgh, Pa.

Greene, W. F.,
Division Engineer, P. R. R.,
3000 Sarah St.,
S. S., Pittsburgh, Pa.

Grewe, H. F.,
Master Mechanic,
Wab.-Pgh. Ter. Ry. Co.,
Carnegie, Pa.

Grieve, Robert E.,
Special Engineman, P. R. R.,
1127 South Ave.,
Wilkinsburg, Pa.

Griswold, W. W.,
Purchasing Agent,
W. & L. E. R. R.,
Cleveland, Ohio.

Gross, C. H.,
Draftsman P. S. C. Co.,
1018 Stanford Road,
N. S., Pittsburgh, Pa.

Grooms, J. C.,
Real Estate and Claim Agent,
P. & L. E. R. R. Co.,
General Office,
Pittsburgh, Pa.

Grove, Sam'l J.,
Gang Foreman,
P. C. C. & St. L. Ry.,
1334 Pritchard St.,
Pittsburgh, Pa.

Groves, W. W.,
District Manager,
Railway Audit & Insp. Co.,
831 Frick Bldg.,
Pittsburgh, Pa.

Grow, C. D.,
Rule Examiner,
B. & O. R. R.,
56 Hazlewood Ave.,
Pittsburgh, Pa.

Guay, J. W.,
Sales Eng'r., Fort Pitt
Steel Casting Co.,
McKeesport, Pa.

Gwaltney, R. H.,
Representative,
The T. H. Tymington Co.,
30 Church St.,
New York, N. Y.

Gyllenflycht, T. E.,
Draftsman, P. S. C. Co.,
1012 Criss St.,
Sheridan, Pa.

Haag, Charles E.,
Storekeeper, P. & L. E. R. R.,
Box 156,
McKees Rocks, Pa.

Hackenberg, J. O.,
Division Engineer,
Pennsylvania R. R.,
Wilmington, Del.

Hackenburg, J. H.,
Ass't. Pur. Agent,
Pressed Steel Car Co.,
Farmers Bank Bldg.,
Pittsburgh, Pa.

Hadley, L. E.,
Gang Foreman, Car Dept.,
P. C. C. & St. L. Ry.,
408 Ridge Ave.,
Carnegie, Pa.

Haggerty, John F.,
Roundhouse Foreman,
B. & O. R. R.,
204 Renova St.,
Glenwood,
Pittsburgh, Pa.

Hague, Jos. R.,
Rep., Independent
Pneumatic Tool Co.,
1208 Farmers Bank Bldg.,
Pittsburgh, Pa.

Haines, E. K.,
102 Owen St.,
McKees Rocks, Pa.

Hair, H. J.,
Salesman, Manning,
Maxwell & Moore,
1005 Park Bldg.,
Pittsburgh, Pa.

Hallett, H. M.,
District Manager,
Penna. Crusher Co.,
1104 Machesney Bldg.,
Pittsburgh, Pa.

Hammond, H. S.,
Sales Agent,
Pressed Steel Car Co.,
1910 Farmers Bank Bldg.,
Pittsburgh, Pa.

Hanna, Wm. T.,
Loco. Eng'r., U. R. R.,
713 Filbert St.,
Pittsburgh, Pa.

Hankele, Edwin W.,
Aububon, Camden Co., N. J.

Hansen, J. M.,
President,
Standard Steel Car Co.,
1131 Frick Bldg.,
Pittsburgh, Pa.

Hansen, G. L.,
Draftsman, P. S. C. Co.,
120 So. Bryant Ave.,
Bellevue, Pa.

Hardman, H. J.,
Acting Chief Clerk,
Penna. R. R. Co.,
207 Penna. Station,
Pittsburgh, Pa.

Harrigan, P. J.,
Genl. Car Foreman,
McKeesport Conn. R. R.,
1106 South Evans Ave.,
McKeesport, Pa.

Harvey, W. B.,
Asst. Foreman, W. A. B. Co.,
277 Welsh Ave.,
Wilmerding, Pa.

Haskin, E. G.,
Mechanical Expert,
Loco. Stoker Co.,
806 Frank St.,
McKees Rocks, Pa.

Hauser, James W.,
Enginehouse Foreman,
P. R. R., Liberty St.,
California, Pa.

Hauser, W. M.,
Accountant I. C. C.,
Municipal Building,
Chattanooga, Tenn.

Haven, Wm.,
Ass't. Supt., B. & O. R. R.,
Pittsburgh, Pa.

Hayes, R. F.,
Eastern Manager,
The Curtain Supply Co.,
Hudson Terminal,
50 Church St.,
New York, N. Y.

Hayes, Scott R.,
Assistant to President,
N. Y. Air Brake Co.,
165 Broadway,
New York, N. Y.

Haymond, C. W.,
Foreman Car Repairs,
P. & L. E. R. R.,
217 S. Garland Ave.,
Youngstown, Ohio.

Haynes, J. E.,
Master Mechanic,
Montour R. R. Co.,
Coraopolis, Pa.

Heckmon, C. J.,
Draftsman,
Spang, Chalfant Co.,
3458 Perrysville Ave.,
N. S., Pittsburgh, Pa.

Hedrick, P. H.,
Erecting Shop Foreman,
P. & L. E. R. R.,
99 Hawthorn Ave.,
Crafton, Pa.

Heinemann, W. G. H.,
Inspector P. R. R.,
3952 Howley Ave.,
Pittsburgh, Pa.

Heisnaner, L. E.,
Gang Foreman Car Dept.,
P. & L. E. R. R.,
52 Frazier Ave.,
McKees Rocks, Pa.

Hench, Norman M.,
Engr. Track Appliances,
Carnegie Steel Co.,
313 Carnegie Bldg.,
Pittsburgh, Pa.

Henderson, J. W.,
Vice President,
Gulick-Henderson Co.,
525 Third Ave.,
Pittsburgh, Pa.

Henry, J. M.,
Asst. Supt., New York Div.,
P. R. R.,
Jersey City, N. J.

Henry, John K.,
Salesman, Laughlin-Barney
Mach'y. Co.,
Union Bank Bldg.,
Pittsburgh, Pa.

Henry, J. S.,
Manager, N. E. Dis't.,
Safety Car Heating and
Lighting Co.,
2 Rector St.,
New York, N. Y.

Hepburn, M. J.,
M. P. Clerk, P. R. R. Co.,
Room 102, Penna. Station,
Pittsburgh, Pa.

Herbick, Nicholas,
Vice President, Simplex
Air Brake Co.,
441 Orchard St.,
Bellevue, Pa.

Herman, John A.,
Purch. Agent,
Spang, Chalfant Co.,
R. F. D. 2—Box 193,
Sharpsburg, Pa.

Hettler, R. C.,
Asst. Genl. Foreman,
Penna. Lines,
N. S., Pittsburgh, Pa.

Hewitt, E. E.,
Draftsman, W. A. B. Co.,
Wilmerding, Pa.

Hickman, Chas. P.,
Clerk, Car Dept.,
P. & L. E. R. R.,
217 So. Garland Ave.,
Youngstown, O.

Hicks, Geo. H.,
1021 Benton Ave.,
N. S., Pittsburgh, Pa.

Higgins, H. L.,
Clerk, Penna. Lines West,
Room 1009, Penna. Station,
Pittsburgh, Pa.

Hilberry, H. H.,
M. M., Penna. Lines,
Mahoningtown, Pa.

Hilferty, Chas. D.,
Rep. Locomotive
Superheater Co.,
69 Elliott Ave.,
Yonkers, N. Y.

Hill, J. F.,
Master Mechanic,
W. & L. E. R. R.,
Brewster, O.

Hindman, S. M.,
Railway Supplies,
932 Oliver Bldg.,
Pittsburgh, Pa.

Hink, Geo. L.,
Piece-Work Insp., P. R. R.,
32nd and Carson Sts.,
S. S., Pittsburgh, Pa.

Hoffman, Chas. T.,
Ass't. Foreman, Machine
Shop, Penna. R. R.,
28th Street,
Pittsburgh, Pa.

Hoffman, J. M.,
Supt. Carnegie Steel Co.,
Box 14,
Monessen, Pa.

Hoffman, N. K.,
Supt. Freight Trans.,
P. & L. E. R. R. Co.,
624 P. & L. E. Depot,
Pittsburgh, Pa.

Hoffstot, H. P.,
Asst. Mgr. Sales,
Pressed Steel Car Co.,
Farmers Bank Bldg.,
Pittsburgh ,Pa.

Hoffstot, John G.,
Asst. Efficiency Engr.,
Pressed Steel Car Co.,
Farmers Bank Bldg.,
Pittsburgh, Pa.

Hogan, W. T.,
Rep., Ball Chemical Co.,
1201 Fulton Bldg.,
Pittsburgh, Pa.

Holbrook, W. H.,
R. F. of Engs.,
P. C. C. & St. L. Ry.,
3273 Ashlyn St.,
Pittsburgh, Pa.

Holmberg, G. N.,
Inspector,
Ajax Rail Anchor Co.,
1204 McCormick Bldg.,
Chicago, Ill.

Holt, H. B.,
Sales Engr., Rosedale
Fdy. and Mach. Co.,
1710 Montpelier St.,
Dormont, Pittsburgh, Pa.

Holt, James,
P. W. Inspector, P. R. R.,
Box 284,
Pitcairn, Pa.

Hood, D. G.,
General Agent,
P. & L. E. R. R. Co.,
Pittsburgh, Pa.

Hood, J. C.,
Vice Prest. and Genl. Mgr.,
Crescent Paste Co.,
Wilkinsburg, Pa.

Hoover, F. M.,
Prest., Hoover & Diggs Co.,
221 Fourth Ave.,
Pittsburgh, Pa.

Hopkins, H. V.,
Asst. Train Master,
B. & L. E. R. R.,
Box 117,
Butler, Pa.

Houser, Harry,
Foreman Electric Car Lighting,
Penna. R. R.,
915 Eureka Street,
Pittsburgh, Pa.

Howard, C. H.,
President, Commonwealth
Steel Company,
Pierce Building,
St. Louis, Mo.

Howat, C. W.,
Asst. Eng'r. Tests,
Union Steel Casting Co.,
62nd and Butler Sts.,
Pittsburgh, Pa.

Howe, David M.,
Railway Supplies,
403 Wabash Bldg.,
Pittsburgh, Pa.

Howe, M. E.,
Salesman, A. Wilhelm Co.,
207 Fulton Bldg.,
Pittsburgh, Pa.

Howe, W. C.,
Supt., Pressed
Steel Car Co.,
N. S., Pittsburgh, Pa.

Huber, H. G.,
General Foreman,
Penna. R. R.,
Enola, Pa.

Huchel, Edward W.,
Clerk, Insp. Dept.,
Carnegie Steel Co.,
668 Frick Annex,
Pittsburgh, Pa.

Huchel, Henry G.,
Draftsman, P. S. C. Co.,
807 Russellwood Ave.,
McKees Rocks, Pa.

Huchel, Wm. J.,
Foreman Carpenters,
Pressed Steel Car Co.,
11 Street, West Park,
McKees Rocks, Pa.

Hudson, Wm. L.,
Road Foreman Engines,
P. R. R. Co.,
Room 217, Penna. Sta.,
Pittsburgh, Pa.

Hughes, Jos. T.,
Assistant Manager,
H. M. Myers Shovel Co.,
Beaver Falls, Pa.

Hukill, J. L.,
232 Home Ave.,
Avalon, Pa.

Humphery, A. L.,
Vice Pres. and Gen. Mgr.,
Westinghouse Air Brake Co.
Wilmerding, Pa.

Hunter, H. S.,
President,
Hunter Saw & Mach. Co.,
57th and Butler Sts.,
Pittsburgh, Pa.

Hunter John A.,
Gang Foreman, P. R. R.,
616 Sixth St.,
Pitcairn, Pa.

Huntley, F. P.,
Vice Pres. and Gen. Mgr.,
Gould Coupler Co.,
30 East 42nd St.,
New York, N. Y.

Huston, F. T.,
General Car Inspector,
Pennsylvania Lines,
Ft. Wayne, Ind.

Hutt, Frank,
Salesman, Midvale Steel Co.,
4825 N. Camac St.,
Philadelphia, Pa.

Hyland, Chas.,
Boiler Expert,
Flannery Bolt Co.,
926 Francis St.,
Jackson, Mich.

Hyndman, F. T.,
Salesman,
S. F. Bowser & Co., Inc.,
3115 Lincoln Blvd.,
Cleveland, Ohio.

Hyndman, H. R.,
Asst. General Freight Agent,
Washington Run R. R. Co.,
2211 First Nat. Bank Bldg.,
Pittsburgh, Pa.

Hyndman, N. P.,
Genl. Freight & Pass. Agent,
Washington Run R. R. Co.,
2211 First Nat. Bank Bldg.,
Pittsburgh, Pa.

Ickes, Ellwood T.,
Care of Worth Bros.,
Coatesville, Pa.

Inks, S. W.,
General Foreman,
P. & L. E. R. R.,
Newell, Pa.

Isler, Chas. J.,
Div. Operator,
Penna. R. R. Co.,
3000 Sarah St.,
Pittsburgh, Pa.

James, J. H.,
Chief Clerk to Gen'l. Mgr.,
P. & L. E. R. R.,
Pittsburgh, Pa.

James, Robert E.,
Asst. Foreman, W. A. B. Co.,
341 Welsh Ave.,
Wilmerding, Pa.

Jameson, A. A.,
Shop Acct., Monon. Ry. Co.,
Box 782,
South Brownsville, Pa.

Jefferson, E. Z.,
Mgr., Hewitt Rubber Co.,
2115 Farmers Bank Bldg.,
Pittsburgh, Pa.

Jenney, Jacob,
F. C. R.,
Monon. Div., P. R. R. Co.,
32nd and Carson Sts.,
S. S., Pittsburgh, Pa.

Jester, Walter,
Locomotive Repairman,
Carnegie Steel Co.,
51st Street,
Pittsburgh, Pa.

Johnson A. B.
Rep., Standard Steel Car Co.,
Frick Bldg.,
Pittsburgh, Pa.

Johnson, E. A,
General Sales Manager,
Duff Mfg. Co.,
Drawer 555,
North Diamond Sta.,
Pittsburgh, Pa.

Johnson, I. S.,
Resident, Material Inspector,
Test Dept., Penna. R. R. Co.,
508 Westinghouse Bldg.,
Pittsburgh, Pa.

Johnson, J. E.,
Manager,
The Garlock Packing Co.,
Chamber Com'rce Bldg.,
Pittsburgh, Pa.

Johnson, J. F.,
Engineer,
Pittsburgh Plate Glass Co.,
Orchard Ave.,
Bellevue, Pa.

Johnson, W. H.,
Brakeman,
Carnegie Steel Co.,
606 Ann St.,
Homestead, Pa.

Johnson, Wm. M., Jr.,
Assistant Superintendent,
B. & L. E. R. R.,
Greenville, Pa.

Jones, L. B.,
Master Mechanic P. R. R.,
Verona, Pa.

Jones, L. W.,
Eastern Manager,
Alloy Steel and Metals Co.,
736 Land Title Bldg.,
Philadelphia, Pa.

Jordan, James E.,
Ass't. Foreman, P. R. R. Co.,
Box 154,
Pitcairn, Pa.

Jungbluth, A.,
Steam Engineer,
Vilsack-Land Co.,
716 Portland Place,
E. E., Pittsburgh, Pa.

Karnes, W. T.,
General Foreman,
P. & L. E. R. R.,
Glassport, Pa.

Keenoy, R. P.,
Supt., Trans., American
Steel and Wire Co.,
15th St. and Penn Ave.,
Pittsburgh, Pa.

Keiser, John,
Passenger Trainmaster,
Penna. R. R.,
425 Center St.,
Wilkinsburg, Pa.

Keithley, J. T.,
General Foreman,
H. C. Frick Coke Co.,
500 Eleanor Ave.,
Scottdale, Pa.

Keller, W. L.,
Traveling Car Inspector,
P. & L. E. R. R.,
McKees Rocks, Pa.

Kelly, H. B.,
Traveling Fireman,
P. & L. E. R. R.,
904 Page St.,
McKees Rocks, Pa.

Kelley, J. B.,
Manager,
Monongahela House,
Pittsburgh, Pa.

Kelley, H. D.,
District Manager,
Goldschmidt Therimt Co.,
1429 Western Ave.,
N. S., Pittsburgh, Pa.

Kennedy, J. E.,
Eng'r., Carnegie Steel Co.,
1214 Rebecca St.,
N. Braddock, Pa.

Kennedy, Julian,
Consulting Engineer,
Bessemer Bldg.,
Pittsburgh, Pa.

Kennedy, N. B.,
Ass't. Foreman Loco. Shop,
Carnegie Steel Co.,
191 Mifflin St.,
Hays, Pa.

Kenney, R. W.,
Salesman, A. M. Byers Co.,
235 Water St.,
Pittsburgh, Pa.

Keptner, J. B.,
Coal Inspector,
P. & L. E. R. R.,
1527 Napoleon St.,
Beechview,
Pittsburgh, Pa.

Kerr, Edward,
President,
Lawrenceville Bronze Co.,
31st St. and Penn Ave.,
Pittsburgh, Pa.

Khuen, Richard,
Gen'l. Mgr. Erection,
American Bridge Co.,
Frick Building,
Pittsburgh, Pa.

Kinch, L. E.,
Sup'r. Signals, P. R. R.,
410 N. Euclid Ave.,
E. E., Pittsburgh, Pa.

Kindle, W. F.,
Insp'r. Carnegie Steel Co.,
905 Woodward Ave.,
McKees Rocks, Pa.

Kinney, M. A.,
Supt. Motive Power,
Hocking Valley Ry.,
Columbus, Ohio.

Kinter, D. H.,
Gen'l. Foreman, Car. Dept.,
Monongahela R. R. Co.,
Brownsville, Pa.

Kirkpatrick, H. F.,
Chief Clerk,
Union Steel Castings Co.,
62nd and Butler Sts.,
Pittsburgh, Pa.

Kissinger, C. F.,
Ass't. Train Master,
P. R. R. Co.,
30th and Sarah Sts., S. S.,
Pittsburgh, Pa.

Klein, Nicholas P.,
Asst. Foreman Car Reps.,
P. R. R. Co.,
So. Pittsburgh, Pa.

Kleine, R. L.,
Chief Car Inspector,
P. R. R. Co.,
Altoona, Pa.

Kleinhans, H.,
415 Oliver Bldg.,
Pittsburgh, Pa.

Klee, W. B.,
President,
Damascus Bronze Co.,
928 South Ave.,
Pittsburgh, Pa.

Knapp, A. D.,
Vice President,
Nicola Lumber Co.,
1410 Farmers Bk. Bldg.,
Pittsburgh, Pa.

Knuetter, Wm.,
Mechanical Engineer,
Carnegie Steel Co.,
327½ East St.,
N. S., Pittsburgh, Pa.

Knight, E. H.,
Ass't. Chief Engr.,
Montour R. R.,
1520 Fourth Ave.,
Coraopolis, Pa.

Knox, Wm. J.,
Mechanical Engineer,
B. R. & P. Ry. Co.,
DuBois, Pa.

Koch, Felix,
Mechanical Engr.,
Pressed Steel Car Co.,
Pittsburgh, Pa.

Koch, H. J.,
Secretary, Fort Pitt
Steel Castings Co.,
McKeesport, Pa.

Kohl, H. J.,
Foreman Pass. Cars,
P. & L. E. R. R.,
1106 Tweed St.,
Pittsburgh, Pa.

Krahmer, E. F.,
Supervising Agent, P. R. R.,
3000 Sarah St.,
S. S., Pittsburgh, Pa.

Krepps, T. S.,
Engineman, P. R. R. Co.,
2114 Eccles St.,
Pittsburgh, Pa.

Kuhnert, C. A.,
Photographer,
W. A. B. Co.,
East McKeesport, Pa.

Kummer, Jos. H.,
Chief Clerk,
Fort Pitt Mall. Iron Co.,
209 Greydon Ave.,
McKees Rocks, Pa.

Lamb, E. H.,
Foreman, Water Dept.,
Union R. R. Co.,
Port Perry, Pa.

Lanahan, Frank J.,
President, Fort Pitt
Mall. Iron Co.,
P. O. Box 1054,
Pittsburgh, Pa.

Lanahan, J. S.,
Asst. to Pres't., Fort Pitt
Mall. Iron Co.,
P. O. Box 1054,
Pittsburgh, Pa.

Lang, W. C.,
General Car Inspector,
P. & L. E. R. R.,
1630 Vance St.,
Coraopolis, Pa.

Lanning, C. S.,
Manager,
J. Frank Lanning & Co.,
914 Union Bank Bldg.,
Pittsburgh, Pa.

Lanning, J. F.,
President,
J. Frank Lanning & Co.,
914 Union Bank Bldg.,
Pittsburgh, Pa.

Lansbery, W. B.,
Wolf & Lansberry,
Room 13, Monongahela
Trust Bldg.,
Homestead, Pa.

Laughlin, C. W.,
President, Laughlin-Barney
Mach'y. Co.,
Union Bank Bldg.,
Pittsburgh, Pa.

Laughner, Carl L.,
Gen'l. Foreman, P. S. C. Co.,
609 Sandusky St.,
Pittsburgh, Pa.

Laurent, George F.,
Foreman Finishing Dept.,
Ft. Pitt Mall. Iron Co.,
716 Island Ave.,
McKees Rocks, Pa.

Laylin, M. H.,
Road Foreman Engines,
W. & L. E. R. R.,
2414 S. Erie St.,
Massillon, Ohio.

Lehr, Harry W.,
Gen'l. Fore. Pass's. Car Insp.,
P. R. R. Co.,
6832 McPherson Blvd.,
Pittsburgh, Pa.

Lent, John F.,
Pres't., Lent Traffic Co.,
Farmers Bank Bldg.,
Pittsburgh, Pa.

Leonard, D. E.,
Sales Manager,
General Equipment Co.,
2335 Oliver Bldg.,
Pittsburgh, Pa.

Leslie, S. I.,
Secretary and Treasurer
The Leslie Co.,
599 Fourteenth Ave.,
Paterson, N. J.

Llewelyn, W. R.,
Inspector, W. A. B. Co.,
7210 Idlewild St.,
Pittsburgh, Pa.

Lewis, H.,
Mgr., Purchases and Supplies,
C. I. & W. R. R.,
Indianapolis, Ind.

Lewis, O. M.,
General Yard Master,
Wabash-Pgh. Ter. Ry.,
1304 Methyl St.,
Pittsburgh, Pa.

Lidstone, F. J.,
Timekeeper, Eng'r. Dept.,
P. S. C. Co.,
McKees Rocks, Pa.

Lincoln, L. P.,
Supt., Structural Dept.,
Carnegie Steel Co.,
725 10th Ave.,
Munhall, Pa.

Lindstrom, Chas. A.,
Ass't. to President,
Pressed Steel Car Co.,
Farmers Bank Bldg.,
Pittsburgh, Pa.

Linehan, M. J.,
Clerk, Car Dept.,
P. C. C. & St. L. Ry.,
3136 Allendale St.,
Pittsburgh, Pa.

Linhart, Walter,
2945 Espey Ave.,
Dormont, Pa.

Lobez, P. I.,
Draftsman, Westinghouse
Air Brake Company,
418 Swissvale Ave.,
Wilkinsburg, Pa.

Lockwood, B. D.,
Chief Engineer,
Pressed Steel Car Co.,
Farmers Bank Bldg.,
Pittsburgh, Pa.

Long, Chas. R., Jr.,
Prest., Chas. R. Long & Co.,
622-630 East Main St.,
Louisville, Ky.

Long, R. M.,
Road Foreman Engines,
P. & L. E. R. R. Co.,
McKees Rocks, Pa.

Lopp, Robt. E.,
Signal Repairman, P. R. R.,
525 Chalfont St.,
Pittsburgh, Pa.

Loughner, M. F.,
P. W. Inspector, P. R. R.,
605 Walnut St.,
Irwin, Pa.

Loughridge, H. W.,
Ass't. Foreman,
P. & L. E. R. R.,
908 Chartiers Ave.,
McKees Rocks, Pa.

Lowe, W. D.,
Prinp. Ass't. Eng'r.,
P. & W. V. Ry. Co.,
2121 Federal St. Ext.,
N. S., Pittsburgh, Pa.

Lower, N. M.,
Chief Engineer,
Loco. Stoker Co.,
Robinson and Darrah Sts.,
N. S., Pittsburgh, Pa.

Lowry, R. N.,
Mech. Engr. Orenstein-
Arthur Koppel Co.,
Koppel, Pa.

Ludwig, K. A.,
Painter Foreman,
P. C. C. & St. L. Ry.,
221 Railroad Ave.,
Carnegie, Pa.

Lustenberger, L. C.,
Ass't. to Ass't. Gen'l. Mgr.
Sales, Carnegie Steel Co.,
314 Carnegie Bldg.,
Pittsburgh, Pa.

Lutton, H. C.,
Road Foreman Engs.,
Monon Ry. Co.,
Box 413,
So. Brownsville, Pa.

Lyle, D. O.,
Asst. on Engr. Corps,
c. o. Valuation Dep't.,
6th Floor, Penna. Station,
Pittsburgh, Pa.

Lynn, Sam'l,
Master Car Builder,
P. & L. E. R. R.,
McKees Rocks, Pa.

Lynn, Wm., Jr.,
Gang Foreman Car Dept.,
P. & L. E. R. R.,
Box 161, R. D. 3,
Coraopolis, Pa.

Lyons, Robt. S.,
Salesman, National
Lead & Oil Co.,
14 Ellzey St.,
Pittsburgh, Pa.

Macfarlane, W. E.,
Ass't. R. F. of E.,
Penna. R. R.,
Elrama,
Washington Co., Pa.

Machen, Ed.,
Gen. Car Foreman,
P. C. C. & St. L. Ry.,
Carnegie, Pa.

Mackenzie, R. H.,
Special R. R. Rep.,
Underwood Typewriter Co,
641 Liberty Ave.,
Pittsburgh, Pa.

Mackert, A. A.,
Chief Inspector, W. A. B. Co.,
450 Caldwell Ave.,
Wilmerding, Pa.

MacKinney, M.,
Ass't. Storekeeper,
P. & L. E. R. R.,
4111 Penn Ave.,
Pittsburgh, Pa.

MacQuown, C.,
Genl. Mgr., Gem Mfg. Co.,
1229 Goebel St.,
N. S., Pittsburgh, Pa.

Maher, J. V.,
Vice Pres't. and Gen. Mgr.,
The Rosemary Coal Co.,
229 Rockefeller Bldg.,
Cleveland ,Ohio.

Maier, John L.,
Gang Foreman,
Penna. Lines,
6 Luray St.,
N. S., Pittsburgh, Pa.

Manion, S. R.,
Storekeeper, Car Dept.,
P. C. C. & St. L. Ry.,
501 Seventh Ave.,
Carnegie, Pa.

Manns, F. F.,
Disbursement Clerk,
W. P. Ter. R. R.,
523 Wabash Bldg.,
Pittsburgh, Pa.

Marshall, W. H.,
Care J. P. Morgan & Co.,
23 Wall St.,
New York, N. Y.

Marshall, W. T.,
Assistant Auditor,
Montour R. R.,
8 Market St..,
Pittsburgh, Pa.

Martin, T. J.,
Engineman, P. R. R.,
Box 15,
West Brownsville, Pa.

Mask, H. K.,
Rep. Nathan Mfg. Co.,
P. O. Box 35,
Flushing, L. I.

Mason, Howard F.,
Civil Eng'r., P. R. R.,
855 Jackson Ave.,
Avalon, Pa.

Mason, R. L.,
1627 Oliver Bldg.,
Pittsburgh, Pa.

Mason, Stephen C.,
Secretary, The
McConway & Torley Co.,
48th St. & A. V. Ry.,
Pittsburgh, Pa.

Masterson, Thos.,
Yard Master, B. & O. R. R.,
3706 Charlotte St.,
Pittsburgh, Pa.

Matchett, H. K.,
Cash Clerk, Penna. Lines,
239 Grant Ave.,
Bellevue, Pa.

Mathias, D. L.,
Research Metallurgist,
Mackintosh, Hemphill & Co.,
12th and Etna Sts.,
Pittsburgh, Pa.

Merscher, John,
Foreman Car Repairs,
P. & L. E. R. R.
348 Woodward Ave.,
McKees Rocks, Pa.

Mertz, Jacob J.,
Gang Foreman Car Dept.,
P. & L. E. R. R.,
879 Railroad St.,
McKees Rocks, Pa.

Meyers, Frank N.,
Chief Clerk, Stores Dept.,
P. & L. E. R. R.,
1012 Third St.,
McKees Rocks, Pa.

Meyers, John M.,
Chief Engineer,
Atlas Automatic Jack Corp.,
5169 Liberty Ave.,
Pittsburgh, Pa.

Meyer, Chas. L.,
Lumber Foreman,
P. & L. E. R. R.,
McKees Rocks, Pa.

Meyer, Wendel J.,
Draftsman, Standard
Steel Car Co.,
216 E. Penn St.,
Butler, Pa.

Millar, Clarence W.,
Mgr. Order Dept.,
Pressed Steel Car Co.,
McKees Rocks, Pa.

Millar, R. J.,
Con. Eng'r.,
51 Rodgers Ave.,
Bellevue, Pa.

Miller, F. L.,
Agent, P. R. R. Co.,
Shady Side Station,
Pittsburgh, Pa.

Miller, Geo. H.,
Machinist, P. & L. E. R. R.,
2932 Glasgow St.,
Sheridan,
Pittsburgh, Pa.

Miller, Jno. F.,
Vice President, Westinghouse
Air Brake Company,
Wilmerding, Pa.

Miller, W. A.,
Rep., J. T. Ryerson & Son,
2202 Oliver Bldg.,
Pittsburgh, Pa.

Miller, Wm.,
Treasurer, Montour R. R.,
1109 Oliver Bldg.,
Pittsburgh, Pa.

Milliken, I. H.,
Rep., The McConway &
Torley Co.,
48th St. and A. V. Ry.,
Pittsburgh, Pa.

Milliken, John M.,
Supt., Tank Car Equipment,
Gulf Refining Co.,
Frick Annex,
Pittsburgh, Pa.

Miner, W. H.,
Railway Supplies,
667 Rookery Building,
Chicago, Ill.

Mitchell, A. G.,
Supt., P. R. R. Co.,
3000 Sarah St.,
S. S., Pittsburgh, Pa.

Mitchell, John,
Gen'l Foreman Union R. R.,
1418 Margaret St.,
Munhall, Pa.

Mitchell, J. Wallace,
Rep., Brown & Co., Inc.,
26 Tenth St.,
Pittsburgh, Pa.

Miyasaki, Yuske,
Draftsman, Engr. Dept.,
Pressed Steel Car Co.,
McKees Rocks, Pa.

Mode, H. C.,
Salesman and Engr.,
W. E. & Mfg. Co.,
Union Bank Bldg.,
Pittsburgh, Pa.

Moffat, H. E.,
Chief Clerk, Acc't. Dept.,
Monon Ry. Co.,
Box 558,
Brownsville, Pa.

Moffet, L. W.,
Asso. Editor,
Iron Trade Review,
2149 Oliver Bldg.,
Pittsburgh, Pa.

Montgomery, J. L.,
Chief Accounting Clerk,
Union R. R.,
1417 Carnegie Bldg.,
Pittsburgh, Pa.

Moore, Chas. B.,
V. P., Oxweld R. R. S. Co.,
339 Railway Exchange,
Chicago, Ill.

Moore, Frank,
Pres't Pgh. Malleable
Iron Co.,
34th & Smallman Sts.,
Pittsburgh, Pa.

Moore, John L.,
Ass't. Sec. and Purch. Agent,
Monon. Connecting R. R.,
3rd Ave. and Ross St.,
Pittsburgh, Pa.

Moore, Lee C.,
Pres., Lee C. Moore & Co.,
313 Sixth Ave.,
Pittsburgh, Pa.

Morgan, David G.,
Superintendent,
J. & L. Steel Co.,
3935 Hoosac St.,
Pittsburgh, Pa.

Mornes, Thomas L.,
Storekeeper, P. & L. E. RR.,
McKees Rocks, Pa.

Morse, L. A.,
Foreman Painters, P. R. R.,
Pitcairn, Pa.

Mott, Samuel L.,
Foreman, Duquesne
Steel Fdry. Co.,
1711 Ridge Ave.,
Coraopolis, Pa.

Mowry, E. H.,
Agent, B & L. E. R. R.,
Duquesne, Pa.

Muhlfeld, J. E.,
Sherbrooke Road,
Scarsdale, N. Y.

Mullin, D. C.,
Ass't. Storekeeper, P. R. R.,
421 Shetland Ave.,
Pittsburgh, Pa.

Murdoch, Harry
Pres't., H. Murdoch & Co.,
432 Wood St.,
Pittsburgh, Pa.

Murphy, Michael,
Loco. Crane Operator,
Carnegie Steel Co.,
51st Street,
Pittsburgh, Pa.

McAbee, W. S.,
C. C. to Asst. Supt.,
Union R. R.,
208 Renova St.,
Pittsburgh, Pa.

McAndrew, R.,
Supervisor of Stores,
B. & L. E. R. R.,
Greenville, Pa.

McBride, Paul A.,
President,
Pgh. Knife & Forge Co.,
Ridge Ave. & Chateau St.,
N. S., Pittsburgh, Pa.

McCaffrey, H. A.,
Asst. Foreman, Car Dept.,
P. C. C. & St. L. Ry.,
50 Linwood Ave.,
Ingram, Pa.

McCandless, Geo. W.,
Treasurer, The
McConway & Torley Co.,
48th St. and A. V. Ry.,
Pittsburgh, Pa.

McCartney, J. L.,
Mgr., Niles Bement Pond Co.,
714 Frick Bldg.,
Pittsburgh, Pa.

McCarty, Dale,
Mech'l. Rep.,
Enterprise Ry. Equip. Co.,
1153 The Rookery,
Chicago, Ill.

McCaslin, A. W.,
Master Blacksmith,
P. & L. E. R. R. Co.,
No. 6 Grace St.,
Mt. Washington,
Pittsburgh, Pa.

McCauley, Wm.,
Ass't. R F. of E.,
Penna. R R.,
28th St. and Liberty Ave.,
Pittsburgh, Pa.

McClements, J. B.,
Mgr. Reymer & Bros.,
Fifth Ave. and Wood St.,
Pittsburgh, Pa.

McClintock, John D.,
Rep., Wm. Sellers & Co., Inc.,
1000 Hamilton St.,
Philadelphia, Pa.

McClumpha, H. E.,
Genl. Supt., National Car
Wheel Company,
Keystone Bldg.,
Pittsburgh, Pa.

McConn, G. E.,
Clerk, M. C. B. Office,
P. & L. E. R. R.,
McKees Rocks, Pa.

McConnell, C. H.,
Asst. Electrical Engr.,
P. & L. E. R. R.,
535 Terminal Sta.,
Pittsburgh, Pa.

McConnell, J. H.,
1776 Sycamore Ave.,
Hollywood, Cal.

McCcllum, Geo. C.,
Asst. Chief Draftsman,
P. S. C. Co.,
McKees Rocks, Pa.

McConway, Wm., Jr.,
Vice President, The
McConway & Torley Co.,
48th St. and A. V. Ry.,
Pittsburgh, Pa.

McDonnell, F. V.,
Master Mechanic,
Penna. Lines,
N. S., Pittsburgh, Pa.

McFarland, H. L.,
Pressed Steel Car Co.,
508 Bayne Ave.,
Bellevue, Pa.

McFeatters, F. R.,
General Superintendent,
Union R. R. Co.,
East Pittsburgh, Pa.

McGhee, W. S.,
Manager,
Enterprise Stamping Co.,
McKees Rocks, Pa.

McIlwain, J. D.,
5532 Howe St.,
Pittsburgh, Pa.

McIntyre, G. L.,
Traveling Eng'r.,
Pgh. Brake Shoe Co.,
1517 Farmers Bank Bldg.,
Pittsburgh, Pa.

McIntyre, R. C.,
Loco. Inspector,
Carnegie Steel Co.,
554 Frick Annex,
Pittsburgh, Pa.

McKee, Frederick C.,
Treas., Winfield R. R.,
2nd Natl. Bank Bldg.,
Pittsburgh, Pa.

McKeen, J. W.,
Rep., Davis Boring Tool Co.,
7620 Tioga St.,
Pittsburgh, Pa.

McKenzie, C. L.,
Pres't. Pgh. Construction Co.,
808 Diamond Bank Bldg.,
Pittsburgh, Pa.

McKinstry, C. H.,
Asst. to Engr. of Tests,
W. A. B. Co.,
419 Westinghouse Ave.,
Wilmerding, Pa.

McLain, J. E.,
Sales Manager,
Midvale-Cambria-Worth,
1812 Oliver Bldg.,
Pittsburgh, Pa.

McLaughlin, Geo. G.,
Foreman Shipping Dept.,
Carnegie Steel Co.,
346 Fifth Ave.,
Homestead, Pa.

McMaster, R. T.,
Inspecting Engineer,
P. & L. E. R. R.,
830 Seventh Ave.,
Coraopolis, Pa.

McMillan, A. E.,
Master Mechanic,
B. & O. R. R.,
Glenwood, Pa.

McNary, F. R.,
Box 97,
Derry, Pa.

McNulty, F. M.,
S. M. P. & R. S., Monon.
Connecting R. R. Co.,
Pittsburgh, Pa.

McVicar, G. E.,
Mechanical Expert,
Galena Signal Oil Co.,
c. o. The Benedict,
Washington, D. C.

Neal, J. T.,
Special Fireman, P. R. R.,
7216 Monticello St.,
Pittsburgh, Pa.

Neale, Jas.,
Secretary, Brown & Co.,
Tenth Street,
Pittsburgh, Pa.

Neel, T. M.,
Draftsman, W. A. B. Co.,
Floral Park,
Wilkinsburg, Pa.

Nelan, E. J.,
Car Dept. Clerk,
Monon. R. R.,
Brownsville, Pa.

Neely, J. L.,
Div., F. A., Am. Sheet
& Tin Plate Co.,
1403 Frick Bldg.,
Pittsburgh, Pa.

Neff, John P.,
Vice President,
American Arch Co.,
30 Church St.,
New York, N. Y.

Nelson, C. A.,
Draftsman, W. A. B. Co.,
Engineering Dept.,
Wilmerding, Pa.

Newburn, T. W.,
Ass't. Resident Eng'r.,
W. A. B. Co.,
Westinghouse Bldg.,
Pittsburgh, Pa.

Newell, E. W.,
Mech'l. Eng'r., W. A. B. Co.,
Wilmerding, Pa.

Newlin, C. E.,
Engineer, U. R. R.,
309 Comrie Ave.,
Braddock, Pa.

Nicol, G. A.,
Asst. Mgr., R. R. Dept.,
H. W. Johns-Manville Co.,
41st and Madison Ave.,
New York, N. Y.

Nieman, C. J.,
Secretary and Treasurer,
Penn Iron & Steel Co.,
Creighton, Pa.

Noble, A. F.,
Factory Rep., Thomson
Electric Welding Co.,
603 Finance Bldg.,
Philadelphia, Pa.

Noble, D. C.,
President, Pittsburgh
Spring & Steel Co.,
1417 Farmers Bank Bldg.,
Pittsburgh, Pa.

Norton, E. K.,
Asst. to President,
Standard Tin Plate Co.,
Canonsburg, Pa.

Nuzum, W. A.,
Master Mechanic,
A. & S. R. R.,
932 Franklin Ave.,
Woodlawn, Pa.

Oates, Geo. M.,
Foreman Painter.
Pressed Steel Car Co.,
429 Jucunda St.,
Mt. Oliver Sta.,
Pittsburgh, Pa.

O'Brien, W. O.,
Road Master, W. P. T. Ry.,
432 Wabash Bldg.,
Pittsburgh, Pa.

O'Connor, M.,
Salesman,
Ingersoll, Rand Co.,
1224 Farmers Bank Bldg.,
Pittsburgh, Pa.

Ogden, F. A.,
General Freight Agent,
Jones & Laughlin Steel Co.,
Pittsburgh, Pa.

Ogden, Geo. D.,
G. F. A., P. R. R. Co.,
Broad St. Station,
Philadelphia, Pa.

Oplinger, W. M.,
Salesman, Celfor Tool Co.,
5515 Kingsessing Ave.,
Philadelphia, Pa.

Orbin, Geo. N.,
Engineman, B. & O. R. R.,
4841 Lytle St.,
Pittsburgh, Pa.

Orchard, Chas.,
Special Agent, Traffic Dept.,
Carnegie Steel Co.,
Pittsburgh, Pa.

Osborne, L. E.,
Chief Draftsman Loco.
Stoker Co.,
Robinson & Darrah Sts.,
N. S., Pittsburgh, Pa

Oschmann, W. O.,
Chief Eng'r. A. & S. S. Ry.,
10th and Muriel Sts.,
S. S., Pittsburgh, Pa.

O'Malley, W. G.,
Manager Crucible Steel Co.,
Midland, Pa.

O'Neil, H.,
Loco. Eng'r. B. & O. R. R.,
4817 Lytle St.,
Hazelwood, Pa.

Painter, Jos.,
R. R. Eq.,
245 Fourth Ave.,
Pittsburgh, Pa.

Pape, Chas. F.,
Mgr., Manufacturing Dept.,
Hutchins Car Roofing Co.,
Hyde Park, Pa.

Parke, F. H.,
Resident Engr., W. A. B. Co.,
318 Westinghouse Bldg.,
Pittsburgh, Pa.

Parry, Wm. L.,
Engineer and Salesman,
Carnegie Steel Co.,
Carnegie Building,
Pittsburgh, Pa.

Patterson, J. E.,
Loco. Engr., U. R. R.,
7236 McClure St.,
Swissvale, Pa.

Patterson, R. F.,
Electrical Engineer,
Pressed Steel Car Co.,
McKees Rocks, Pa.

Pearce, F. H.,
Draftsman, P. S. C. Co.,
405 Russellwood Ave.,
McKees Rocks, Pa.

Pearson, A. B.,
Draftsman, H. K. Porter Co.,
106 Tenth St.,
Aspinwall, Pa.

Pehrson, A. K.,
Ass't. Chief Draftsman,
Pressed Steel Car Co.,
McKees Rocks, Pa.

Pennepacker, N. W.,
M. P. Inspector, P. R. R.,
Care Master Mechanic,
West Philadelphia, Pa.

Pennington, F. W.,
Engr., W. A. B. Co.,
East McKeesport, Pa.

Penton, John A.,
President, The Penton Pub. Co.,
Cleveland, O.

Perkins, Chas. F.,
General Manager,
Davis Brake Beam Co.,
Box 192,
Johnstown, Pa.

Perry, W. E.,
Asst. Chief Clerk,
Penna. Lines West,
Room 1009, Penna. Sta.,
Pittsburgh, Pa.

Pfeil, John,
President, American
Spiral Spring and Mfg. Co.,
56th and Butler Sts.,
Pittsburgh, Pa.

Phillips, Lee,
Representative,
National Radiator Co.,
Terran Ave.,
Carnegie, Pa.

Platt, J. G.,
Vice President, Hunt-Spiller
Manufacturing Corp.,
383 Dorchester Ave.,
So. Boston, Mass.

Porter, C. D.,
Master Mechanic,
P. R. R.,
28th and Liberty Sts.,
Pittsburgh, Pa.

Porter, H. V.,
C. C. to Pur. Agent,
B. & L. E. R. R. Co.,
512 Frick Bldg.,
Pittsburgh, Pa.

Porter, H. T.,
Chief Engineer,
B. & L. E. R. R. Co.,
Greenville, Pa.

Porter, W. E.,
Asst. Chief Smoke Inspr.,
City of Pittsburgh,
5150 Liberty Ave.,
Pittsburgh, Pa.

Post, Geo. A.,
President,
Standard Coupler Co.,
30 Church St.,
New York, N. Y.

Postlethwaite, C. E.,
Gen'l. Sales Manager,
Pressed Steel Car Co.,
24 Broad St.,
New York, N. Y.

Pratt, I. D.,
Ass't. Gen'l. Car Insp'r.,
Penna. R. R.,
419 Agatha St.,
Pitcairn, Pa.

Pratt, L. P.,
Rep. Yarnall Paint Co.,
1026 Race St.,
Philadelphia, Pa.

Price, Geo. L.,
Gen'l. Foreman,
Boiler Makers,
American Loco. Co.,
1211 Fayette St.,
N. S., Pittsburgh, Pa.

Price, M. J.,
Engr Homestead Steel Co.,
701 18th Ave.,
Munhall, Pa.

Prickman, W. R.,
Ass't. Gen'l. Fr't. Agent,
P. & W. Va., Ry.,
425 Wabash Bldg.,
Pittsburgh, Pa.

Prosser, C. S.,
Manager, R. R. Dept.,
Peerless Rubber Mfg. Co.,
31 Warren Street,
New York, N. Y.

Proven, John,
Superintendent, Pittsburgh
Spring & Steel Co.,
1416 Farmers Bank Bldg.,
Pittsburgh, Pa.

Provost, J. P.,
V. Prest. and Secy.,
Union Electric Co.,
31 Terminal Way,
Pittsburgh, Pa.

Pulliam, O. S.,
Genl. Mgr., Pittsburgh
Steel Foundry Co.,
1208 House Bldg.,
Pittsburgh, Pa.

Purdy, W. F.,
Chief Engineer, Wabash-
Pgh. Terminal Ry.,
Pittsburgh, Pa.

Quest, W. O.,
Master Car Painter,
P. & L. E. R. R. Co.,
Pittsburgh, Pa.

Rabold, W. E.,
Shop Clerk, P. R. R. Co.,
Liberty Ave. & 28th St.,
Pittsburgh, Pa.

Ralph, J. E.,
Foreman, P. & L. E. R. R.,
1219 Fourth Ave.,
Coraopolis, Pa.

Ralston, John A.,
Mech. Engr., U. R. R. Co.,
554 Frick Annex,
Pittsburgh, Pa.

Ralston, J. S.,
President,
Ralston Steel Car Co.,
First Nat'l Bank Bldg.,
Columbus, Ohio.

Rambo, R. E.,
Civil Engr., P. R. R.,
601 Hampton Ave.,
Wilkinsburg, Pa.

Ramsdell, F. E.,
Train Master,
P. & L. E. R. R.,
McKees Rocks, Pa.

Raser, Geo. B.,
Sales Engr.,
Ingersoll-Rand Co.,
1226 Farmers Bank Bldg.,
Pittsburgh, Pa.

Rayburn, W. R.,
Salesman, Wolff Brush Co.,
503 Lilley Ave.,
Columbus, O.

Rea, C. S.,
Sales Manager,
Ralston Steel Car Co.,
2210 Oliver Bldg.,
Pittsburgh, Pa.

Ream, A. H.,
Master Mechanic,
P. & S. R. R.,
Brookville, Pa.

Redding, D. J.,
Ass't. Supt. Motive Power,
P. & L. E. R. R. Co.,
McKees Rocks, Pa.

Reed, W. S.,
Freight Claim Agent,
W. P. Ter. R. R.,
Wabash Bldg.,
Pittsburgh, Pa.

Reese, C. E.,
Order Dept.,
Standard Tin Plate Co.,
Canonsburg, Pa.

Reese, O. P.,
Sup't. Motive Power,
Penna. Lines,
Toledo, Ohio.

Reese, W. J.,
Secy., Std. Tin Plate Co.,
Canonsburg, Pa.

Regan, W. J.,
Mechanical Engineer,
The McConway-Torley Co.,
Pittsburgh, Pa.

Rehlin, T. C.,
Draftsman, P. S. C. Co.,
3424 Fleming Ave.,
N. S., Pittsburgh, Pa.

Replogle, H. L.,
Gen'l. Sales Representative,
Davis Brake Beam Co.,
Box 192,
Johnstown, Pa.

Reymer, C. H.,
Manager Order Dept.,
O. I. & S. Co.,
So. 10th and Muriel Sts.,
Pittsburgh, Pa.

Reynolds, T. A.,
Foreman,
McConway & Torley Co.,
22 Fountain Ave.,
Crafton, Pa.

Rhodes, G. P.,
Treasurer,
National Car Wheel Co.,
1305 Keystone Bldg.,
Pittsburgh, Pa.

Rhodes, Jas. D.,
President,
National Car Wheel Co.,
1305 Keystone Bldg.,
Pittsburgh, Pa.

Rice, D. S.,
Foreman Boiler Shop,
Penna. R. R. Co.,
28th St. Shops,
Pittsburgh, Pa.

Richardson, C. A.,
Engineer, B. & O. R. R.,
127 Johnston Ave.,
Pittsburgh, Pa.

Richardson, L.,
Engine House Foreman,
P. R. R.,
Philipston, Pa.

Richardson, W. P.,
Room 1019
Interstate Commerce Bldg.,
Washington, D. C.

Rider, J. B.,
General Manager,
Pressed Steel Car Co.,
Farmers Bank Bldg.,
Pittsburgh, Pa.

Ridley, R. C.,
Loco. Engr., Union R. R.,
1915 Monroe St.,
Swissvale, Pa.

Riley, Geo. N.,
Nat'l. Tube Co.,
Frick Building,
Pittsburgh, Pa.

Riley, T. J.,
Ass't. Eng. House Foreman,
Penna. R. R. Co.,
143 45th St.,
Pittsburgh, Pa.

Ritts, Wm. H.,
Steam Engineer,
Spang, Chalfant & Co.,
Pine St.,
Etna, Pa.

Rodgers, G. L.,
Chief of Traffic Bureau,
Monon Ry. Co.,
Box 648,
Brownsville, Pa.

Rodgers, Robt. J.,
Clerk, P. R. R.,
1203 Boyle St.,
N. S., Pittsburgh, Pa.

Rogan, John A.,
M. M., Div. No. 1,
Pgh. Railways Co.,
7312 Race St.,
Pittsburgh, Pa.

Rogers, R. E.,
Vice Pres., Jas. B. Sipe Co.,
1122 Bessemer Bldg.,
Pittsburgh, Pa.

Rogers, W. R.,
Chief Joint Insp't.,
P. & L. E. & Erie R. R.
Youngstown, Ohio.

Rohn, W. B.,
Chief Clerk,
Pressed Steel Car Co.,
Farmers Bank Bldg.,
Pittsburgh, Pa.

Rooney, E. S.,
District Sales Agent,
Youngstown Sheet and
Tube Co.,
1626 Oliver Bldg.,
Pittsburgh, Pa.

Root, E. E.,
Master Mechanic,
Monon. R. R.,
Box 566,
Brownsville, Pa.

Root, R. R.,
Enginehouse Foreman,
Maple Ave. and Fourth St.,
Aspinwall, Pa.

Rose, A. J.,
Superintendent,
Greenville Steel Car Co.,
74 Harrison St.,
Greenville, Pa.

Rosenstock, J. H.,
Master Trans.,
General Electric Co.,
84 Office Bldg.,
Schenectady, N. Y.

Ross, R. J.,
Salesman, W. E. & Mfg. Co.,
1442 Widener Bldg.,
Philadelphia, Pa.

Runser, K. W.,
c. o. The Baker Dunbar
Allen Co.,
Union Arcade,
Pittsburgh, Pa.

Rupprecht, K. J.,
Clerk, P. R. R.,
317 N. St. Clair St.,
Pittsburgh, Pa.

Ryder, Gilbert E.,
Asst. to Vice President,
Loco. Superheater Co.,
30 Church St.,
New York

Ryman, Frank,
Pres't. Etna Forge & Bolt
Co., 808 House Bldg.,
Pittsburgh, Pa.

Rys, C. F. W.,
Met. Engineer,
Carnegie Steel Co.,
517 Carnegie Bldg.,
Pittsburgh, Pa.

Sadd, L. C.,
Secretary,
T. H. Nevin Co.,
Island and Preble Aves.,
N. S., Pittsburgh, Pa.

Sage, Ralph V.,
Rep. Cambria Steel Co.,
Widener Bldg.,
Philadelphia, Pa.

Saints, Chas. A.,
Salesman,
A. W. Cadman Mfg. Co.,
2814 Small St.,
Pittsburgh, Pa.

Sampson, W. F.,
Asst. M. M., P. R. R.,
28th and Liberty Sts.,
Pittsburgh, Pa.

Sanderson, W. W.,
Mgr., The Carborundum Co.,
18 Wood St.,
Pittsburgh, Pa.

Sandman, A. G.,
Chief Draftsman,
B. & O. R. R.,
Canterbury Hall,
39th and Oak Sts.,
Baltimore, Md.

Sargent, F. W.,
Chief Engineer, American
Brake Shoe & Foundry Co.,
30 Church St.,
New York, N. Y.

Sattley, E. C.,
Gen'l. Manager, Page
Woven Wire Fence Co.,
644 Union Arcade,
Pittsburgh, Pa.

Sawyer, E. L.,
Salesman,
Homestead Realty Co.,
143 East Eighth Ave.,
Homestead, Pa.

Schaaf, A. J.,
Chief Engr. Marine Dept.,
Pittsburgh Coal Co.,
142 Merrimac St.,
S. S., Pittsburgh, Pa.,

Schaefer, Frederic,
Schaefer Equipment Co.,
2143 Oliver Bldg.,
Pittsburgh, Pa.

Schaich, Wm. L.,
Estimator, P. S. C. Co.,
1233 Dickson St.,
N. S., Pittsburgh, Pa.

Schauer, A. J.,
Ass't. Train Master,
Mon. Div., P. R. R. Co.,
124 Rochelle St.,
Pittsburgh, Pa.

Scheck, H. G.,
Road Foreman Engines,
Monon. Div., P. R. R. Co.,
32nd St., S. S.,
Pittsburgh, Pa.

Schiller, John
Traveling Con'dr.,
P. & W. Va. Ry.,
652 Bell Ave.,
East Carnegie, Pa.

Schleiter, W. F.,
Vice President and Sec'y.,
Dilworth, Porter & Co.,
313 Sixth Ave.,
Pittsburgh, Pa.

Schoen, W. H.,
617 Farmers Bank Bldg.,
Pittsburgh, Pa.

Schofield, J. S.,
Rep. Atlantic Refining Co.,
424 6th Ave.,
Pittsburgh, Pa.

Schomberg, Wm. T.,
Blacksmith Foreman,
Pennsylvania Company,
1902 Morrell St.,
N. S., Pittsburgh, Pa.

Schreiner, W. C.,
Manager, Main Belting Co.,
33 Terminal Way,
Pittsburgh, Pa.

Schuchman, W. R.,
Sec. & Treasurer,
Homestead Valve Mfg. Co.,
Homestead, Pa.

Schwegler, H.,
Foreman, Penna. R. R.,
129 Irving Ave.,
Crafton, Pa.

Schultz, Geo. H.,
Inspector, Penna. R. R. Co.,
403 Second Nat'l Bank Blg.,
Pittsburgh, Pa.

Scott, Robert T.,
Mgr., Independent Pneumatic
Tool Company,
1208 Farmers Bank Bldg.,
Pittsburgh, Pa.

Searles, E. J.,
c. o. Schaefer Equipment Co.,
2143 Oliver Bldg.,
Pittsburgh, Pa.

See, Theo. S.,
Supt., Jones & Laughlin
Steel Co.,
3624 Perrysville Ave.,
N. S., Pittsburgh, Pa.

Seiss, W. C.,
Foreman Car Insp'rs,
P. C. C. & St. L. Ry.,
2786 Zephyr Ave.,
Sheridanville,
Pittsburgh, Pa.

Severance, F. W.,
President,
S. Severance Mfg. Co.,
Glassport, Pa.

Sewell, H. B.,
R. R. Salesman, H. W. Johns-
Manville Co.,
Westinghouse Bldg.,
Pittsburgh, Pa.

Shaner, E. L.,
314 Penton Bldg.,
Cleveland, O.

Shannon, Chas.,
Rep., The Lowe Bros. Co.,
210 Winebiddle Ave.,
E. E., Pittsburgh, Pa.

Sheetz, E. S.,
Gang Foreman,
P. & L. E. R. R.,
322 Grove St.,
McKees Rocks, Pa.

Shelhart, Chas. R.,
Ass't. Shop Clerk P. R. R.,
7480 Delmar Way,
Swissvale, Pa.

Shirk, A. R.,
Asst. Engr., W. P. T. Ry.,
Wabash Bldg.,
Pittsburgh, Pa.

Short, L.,
General Foreman,
P. & L. E. R. R.,
106 Richlieu Ave.,
New Castle, Pa.

Shorthill, R. R.,
223 West 9th Ave.,
Homestead, Pa.

Shourek, Theo. L.,
Draftsman, Penna. R. R.,
204 Penna Station,
Pittsburgh, Pa.

Shuck, Wm. C.,
Salesman, Lockhart Iron &
Steel Company,
P. O. Box 1243,
Pittsburgh, Pa.

Sleeman, Wm. C.,
Draftsman, P. S. C. Co.,
205 Sagamore St.,
Pittsburgh, Pa.

Slick, E. E.,
Vice-Pres't. and Gen. Mgr.,
Cambria Steel Co.,
Johnstown, Pa.

Slutzker, Jospeh,
Asst. Engr. M. P., P. R. R.,
203 Penna. Station,
Pittsburgh, Pa.

Smead, D. N.,
Draftsman, P. R. R.,
453 Third St.,
Pitcairn, Pa.

Smith, D. W.,
Foreman,
Pennsylvania Lines West,
1025 Morrison Ave.,
N. S., Pittsburgh, Pa.

Smith, Edward B.,
Rep., American Brake Shoe &
Foundry Co.,
30 Church St.,
New York, N. Y.

Smith, F. C.,
Station Master,
P. & L. E. R. R.,
3040 Merwyn Ave.,
Pittsburgh, Pa.

Smith, J. B.,
Foreman Boiler Maker,
P. & L. E. R. R.,
McKees Rocks, Pa.

Smith, John H.,
Foreman, P. R. R.,
570 Second St.,
Box 106,
Pitcairn, Pa.

Smith, John L.,
Master Mechanic,
P. S. & N. R. R.,
St. Marys, Pa.

Smith, Joseph V.,
Mgr., Shovel Dept.,
Hubbard & Co.,
62nd and Butler St.,
Pittsburgh, Pa.

Smith, M. A.,
General Foreman,
P. & L. E. R. R. Co.,
27 Glenaven Ave.,
Youngstown, O.

Smith, M. de K.,
Supervisor, P. R. R.,
Trenton, N. J.

Smith, P. F., Jr.,
Genl. Supt. M. P.,
Penna. Lines,
1902 Penna. Station,
Pittsburgh, Pa.

Smith, Willard A.,
Prest., The Railway Review,
Suite 1407, Ellsworth Bldg.,
Chicago, Ill.

Smith, W. R.,
Division Operator, P. R. R.,
314 Second St.,
Aspinwall, Pa.

Smithson, A. D.,
Clerk, Union Star Line,
Fulton Bldg.,
Pittsburgh, Pa.

Snider, Charles,
Chief Clerk to Mast. Mech.,
Monon. Ry. Co.,
So. Brownsville, Pa.

Snitehurst, James G.,
Engine House Foreman,
Penna. R. R. Co.,
P. O. Box 35,
Youngwood, Pa.

Snyder, C. H.,
Chief Clerk to Master
Carpenter, P. R. R.,
Eastern & Freeport Aves.,
Aspinwall, Pa.

Snyder, F. I.,
Chief Clerk to V. P. & G. M.,
B. & L. E. R. R. Co.,
727 Union Arcade,
Pittsburgh, Pa.

Snyder, G. W.,
Asst. Engr. M. of W.,
P. R. R.,
Broad St. Station,
Philadelphia, Pa.

Snyder, Joseph,
General Foreman,
P. & L. E. R. R.,
P. O. Box 39,
Dawson, Pa.

Snyder, J. Rush,
Vice-President,
Pittsburgh Air Brake Co.,
309 Carson St.,
S. S., Pittsburgh, Pa.

Snyder, John W.,
Supt. Signals, P. R. R.,
124 West Penn Ave.,
Aspinwall, Pa.

Snyder, Rudolph,
E. H. Foreman, P. R. R.,
600 Brownsville Road,
Mt. Oliver, Pa.

Spaeth, W. F.,
Asst. R. F. Engs., Penna. Co.,
112 Branch St.,
Carnegie, Pa.

Spear, A. E.,
Supt. Pa. & McK. R. R.,
McKees Rocks, Pa.

Spencer, Robert L.,
Supt., Duquesne
Warehouse Co.,
Pittsburgh, Pa.

Spielmann, J. A.,
Asst. to Genl. Supt.,
B. & O. R. R.,
Pittsburgh, Pa.

Spindler, David G.,
Loco. Engr., Union R. R.,
632 Fourth St.,
Braddock, Pa.

Stafford, B. E. D.,
Vice-Prest. and Genl. Mgr.,
Flannery Bolt Company,
Vanadium Bldg.,
Pittsburgh, Pa.

Stafford, Saml. G.,
President,
Vulcan Crucible Steel Co.,
Aliquippa, Pa.

Stall, Roy L.,
Div. Pass'r. Agent, P. R. R.,
212 Oliver Bldg.,
Pittsburgh, Pa.

Stamets, Wm. K.,
7045 Jenkins Arcade,
Pittsburgh, Pa.

Stanton, Thomas,
Gang Foreman Car Dept.,
P. & L. E. R. R.,
431 Island Ave.,
McKees Rocks, Pa.

Stark, F. H.,
Genl. Supt. Montour R. R.,
1711 State Ave.,
Coraopolis, Pa.

Stark, James L.,
General Sales Agent,
Chicago-Cleveland Car Roofing Co., Room 368,
50 Church St.,
New York, N. Y.

Staneart, R. A.,
Gang Foreman,
P. C. C. & St. L. Ry.,
3065 Merwyn Ave.,
Pittsburgh, Pa.

Steele, W. K.,
Chief Car Distributor,
P. R. R. Co.,
Room 318, Penna. Sta.,
Pittsburgh, Pa.

Stephenson, B. S.,
Resident Agent,
M. A. Hanna & Co.,
1445 Oliver Bldg.,
Pittsburgh, Pa.

Stevenson, Paul V.,
Res. Mgr., Morse Chain Co.,
Westinghouse Bldg.,
Pittsburgh, Pa.

Stevenson, Robert,
Foreman Car Repairs,
P. & L. E. R. R.,
Newell, Pa.

Stevenson, William,
Foreman, P. & L. E. R. R.,
509 Woodward Ave.,
McKees Rocks, Pa.

Stillings, Wm. R.,
Charge of Loco's.,
Carnegie Steel Co.,
57 Elm St.,
Sharon, Pa.

Storer, N. M.,
Genl. Engr., W. E. & M. Co.,
East Pittsburgh, Pa.

Storrs, Chas. P.,
Manager, R. R. Dept.,
Storrs Mica Co.,
Owego, N. Y.

Streib, J. F.,
Ass't. Chief Engr.,
Pressed Steel Car Co.,
Taylor Ave.,
Avalon, Pa.

Stucki, A.,
Engineer,
419 Oliver Bldg.,
Pittsburgh, Pa.

Stumpf, F. L.,
A. B. Instr., P. R. R.,
407 Maple Ave.,
Aspinwall, Pa.

Stratman, L. J.,
Clerk, Purchasing Dep't.,
Pressed Steel Car Co.,
157 S. Bryant Ave.,
Bellevue, Pa.

Strauss, I. H.,
Freight Agent, P. R. R.,
Barl ean St. & Duquesne Way,
Pittsburgh, Pa.

Sturmer, Geo. W.,
Special Rep., B. & O. R. R.,
Baltimore, Md.

Styers, J. V.,
General Freight Agent,
B. & L. E. R. R.,
Union Arcade,
Pittsburgh, Pa.

Suckfield, G. A.,
Special Engineer,
Pressed Steel Car Co.,
McKees Rocks, Pa.

Suhrie, Norman,
Traveling Engineer,
Penna. R. R. Co.,
1830 Eleventh Ave.,
Altoona, Pa.

Sullivan, M. J.,
Gang Foreman Car Dept.,
P. & L. E. R. R.,
43 Highland Ave.,
McKees Rocks, Pa.

Summers, J. Mills,
Secretary and Treasurer,
Summers Steel Car Co.,
2324 Oliver Building,
Pittsburgh, Pa.

Suydam, R. S.,
President,
M. B. Suydam Co.,
61st and Butler Sts.,
Pittsburgh, Pa.

Swann, J. B.,
G. F. C. D., Penna.
Lines, S. W. System,
Columbus, Ohio.

Swartz, H. E.,
Ass't. Treasurer,
Pressed Steel Car Co.,
Room 1906,
Farmers Bank Bldg.,
Pittsburgh, Pa.

Swayne, H. B.,
Asst. Supt., P. S. C. Co.,
N. S., Pittsburgh, Pa.

Swope, B. M.,
Ass't. Master Mechanic,
Penna. R. R. Co.,
Box 565,
Renovo, Pa.

Synnestvedt, Paul,
Attorney,
1201 Chestnut St.,
Philadelphia, Pa.

Tanner, Chas. J.,
Draftsman,
Monon. Ry. Co.,
209 Fifth Ave.,
Brownsville, Pa.

Tate, James B.,
Clerk, P. S. C. Co.,
512 Highland Place,
Bellevue, Pa.

Tate, Halph H.,
Gen'l. Mgr. Sales, Penna.
Casting & Machine Wks.,
1305 Keystone Bldg.,
Pittsburgh, Pa.

Taylor, Frank C.,
Gen'l. Car Insp'r.,
P. B. & W. R. R.,
Wilmington, Del.

Taylor, H. G.,
Pres. Ball Chemical Co.,
1201 Fulton Bldg.,
Pittsburgh, Pa.

Taylor, James,
Spc'l Apprentice W. A. B. Co.,
425 Westinghouse Ave.,
Wilmerding, Pa.

Tennant, S. D.,
Gang Foreman, Car Dept.,
P. & L. E. R. R.,
2334 Maple Ave.,
N. S., Pittsburgh, Pa.

Tesseyman, J. E.,
Works Manager, Chicago-
Cleveland Car Roofing Co.,
Warren, Ohio

Thiele, C. F.,
Chief Car Insp't.,
1002 Penna. Station,
Pittsburgh, Pa.

Thomas, Chas.,
Ass't. Train Master,
P. & L. E. R. R. Co.,
McKees Rocks, Pa.

Thomas, E.,
Superintendent,
Union R. R. Co.,
East Pittsburgh, Pa.

Thomas, E. K.,
Master Mechanic,
Aetna Chemical Co.,
21 Park St.,
Crafton, Pa.

Thomas, Frank B.,
Asst. Chief Draftsman,
W. A. B. Co.,
738 Kelly Ave.,
Wilkinsburg, Pa.

Thomas, J. H.,
Ass't. Master Mechanic,
P. R. R.,
28th St. & Liberty Ave.,
Pittsburgh, Pa.

Thompson, C. H.,
Yard Master,
Union R. R. Co.,
420 Todd St.,
Wilkinsburg, Pa.

Thompson, H. H.,
Chief Clerk to Supt. M. P.,
P. & L. E. R. R.,
400 Wayne Ave.,
McKees Rocks, Pa.

Thurlby, A. R.,
Road Foreman of Engines,
P. & L. E. R. R.,
McKees Rocks, Pa.

Tibbals, S. B.,
Foreman, Car Dept.,
Montour R. R.,
1623 Ridge Ave.,
Coraopolis, Pa.

Townsend, J. F.,
Traffic Manager,
National Tube Co.,
1922 Frick Bldg.,
Pittsburgh, Pa.

Trainer, M. N.,
Salesman,
American B. S. & Fdy. Co.,
6325 Douglas Ave.,
Pittsburgh, Pa.

Trainor, Jos. A.,
Sales Dept., The Baldwin
Locomotive Works,
Philadelphia, Pa.

Transue, O. F.,
V. Pres. and Genl. Mgr., The
Transue & Williams Co.,
Alliance, Ohio.

Travis, J. H.,
Foreman Electrician,
P. R. R. Co.,
Lock Box 5,
Pitcairn, Pa.

Truax, William E.,
Yard Master,
Penna. R. R. Co.,
Box 75,
Elrama, Pa.

Tucker, Jno. L.,
Special Duty,
Monon. Div., P. R. R. Co.,
5175 Liberty Ave.,
Pittsburgh, Pa.

Turner, F. M.,
General Superintendent,
A. & S. S. R. R. Co.,
Cor. 10th and Muriel Sts.,
S. S. Pittsburgh, Pa.

Turner, J. J.,
Vice President,
Pennsylvania Lines,
909 Penna. Station,
Pittsburgh, Pa.

Turner, J. S.,
Sales Agent,
Pressed Steel Car Co.,
24 Broad St.,
New York, N. Y.

Turner, L. H.,
Supt. Motive Power,
P. & L. E. R. R. Co.,
General Office,
Pittsburgh, Pa.

Turner, Walter V.,
Manager of Engineering,
Westinghouse Air Brake
Company,
Pittsburgh, Pa.

Tweed, H. W.,
Assistant Auditor,
Monon. Ry. Co.,
Box 553,
Brownsville, Pa.

Uhler, J. Lloyd,
Metallurgist,
Union Steel Casting Co.,
62nd and Butler Sts.,
Pittsburgh, Pa.

Unger, J. S.,
Manager, Central Research
Bureau, Carnegie Steel Co.,
1054 Frick Annex Bldg.,
Pittsburgh, Pa.

Vallney, M. T.,
Salesman, Freedom Oil
Works Co.,
818 Crawford St.,
Pittsburgh, Pa.

Van Dalsen, G. A.,
Draftsman, P. S. C. Co.,
817 Tenth St., West Park,
McKees Rocks, Pa.

Vissering, Harry,
President.
Harry Vissering & Co.,
1614 Lytton Bldg.,
Chicago, Ill.

Vonkrogh, F. F.,
Draftsman,
Standard Steel Car Co.,
606 N. McKean St.,
Butler, Pa.

Vowinkel, F. F.,
Salesman, Dilworth, Porter
& Co., Ltd.,
Fourth and Bingham St.,
Pittsburgh, Pa.

Waddell, F. W.,
Asst. Supt.,
Schoen Steel Wheel Wks.,
749 Frederick St.,
McKees Rocks, Pa.

Waggoner, R. E.,
Chief Engr., Sarnegie S. Co.,
116 North Fairmont Ave.,
Pittsburgh, Pa.

Wagner, C. W.,
919 Hearsh Bldg.,
Chicago, Ill.

Wagner, George F.,
Agent, Pgh. Transfer,
P. R. R.,
Box 751,
Pittsburgh, Pa.

Wahlert, H. A.,
Rep., Westinghouse
Air Brake Co.,
1407 Boatsmen Bk. Bldg.,
St. Louis, Mo.

Wallgren, N. O.,
Estimator, Kennedy-Stroh
Corporation,
200 Seventh St.,
Oakmont, Pa.

Walker, E. H.,
V. P. The Standard
Coupler Co.,
30 Church St.,
New York, N. Y.

Walker, J. W.,
Genl. A. B. & Steam Heat
Inspector, Penna. R. R.,
207 Penna. Station,
Pittsburgh, Pa.

Walther, G. C.,
Foreman Car Inspectors,
Penna. R. R. Co.,
Verona, Pa.

Waltz, M. H.,
Steam and Electrical Engr.,
W. P. Ter. Ry.,
Wabash Bldg.,
Pittsburgh, Pa.

Ward, Frank B.,
502 Park Bldg.,
Pittsburgh, Pa.

Warfel, J. A.,
General Manager,
Superior Oxygen Co.,
2515 Liberty Ave.,
Pittsburgh, Pa.

Warne, J. C.,
Supt., Penna. Casting &
Machine Co.,
505 Preble Ave.,
N. S., Pittsburgh, Pa.

Warner, E. O.,
Representative,
The National Malleable
Castings Co.,
1203 Liberty Bldg.,
Philadelphia, Pa.

Warnock, Harry R.,
Supt. M. P. W. M. Ry.,
Hagerstown, Md.

Wassell, F. L.,
Sales Mgr. Loco. Stoker Co.,
757 Railway Exchange Bldg.,
Chicago, Ill.

Watkins, G. H.,
Master Mechanic,
Penna. R. R.,
Wilmington, Del.

Way, L. A.,
Supt., Duquesne Steel
Foundry Co.,
Coraopolis, Pa.

Waycott, Albert,
President,
Damascus Brake Beam Co.,
London Road &
N. P. R. R.,
Cleveland, O.

Weaverling, J. H.,
Chief Dispatcher,
B. & O. R. R.,
310 B. & O. Depot,
Pittsburgh, Pa.

Wegener, Henry,
Car Foreman W. P. T. Ry.,
No. 1 Moflat St.,
East Carnegie, Pa.

Weigel, Fred S.,
Asst. Train Master,
P. & L. E. R. R.,
1056 Vance Ave.,
Coraopolis, Pa.

Weisbrod, J. F.,
Asst. to President,
National Car Wheel Co.,
1305 Keystone Bldg.,
N. S., Pittsburgh, Pa.

Wendt, Edwin F.,
Member, Engr. Board,
Interstate Commerce Com.,
Washington, D. C.

Wenrich, M. L.,
Asst. R. F. of Engs.,
Penna. R. R. Co.,
2608 Beale Ave.,
Altoona, Pa.

Weston, A. H.,
Sales Engineer,
The T. H. Symington Co.,
30 Church St.,
New York, N. Y.

Wharton, J. E.,
519 East Elm St.,
Lima, O.

White, F. L.,
Mechanical Engineer,
Carnegie Steel Co.,
1105 Chislett St.,
Pittsburgh, Pa.

Wickham, Chas. M.,
Traveling Engr.,
Loco. Superheater Co.,
26 Royal St.,
Allston, Mass.

Widmeier, L. W.,
Asst. Sales Manager,
American Flexible Bolt Co.,
50 Church St.,
New York, N. Y.

Wilder, Henry W.,
Draftsman, P. S. C. Co.,
931½ Woodward Ave.,
McKees Rocks, Pa.

Wilkoff, L. C.,
Sec'y., Youngstown Steel
Car Co.,
Youngstown, O.

Williams, B. D.,
Chief Clerk to Train Master,
Monon Ry. Co.,
111 Broadway,
Brownsville, Pa.

Williams, F. C.,
Accountant, Monon. Ry.,
Box 41,
W. Brownsville, Pa.

Williams, Irving,
P. O. Box 154,
Chambersburg, Pa.

Williams, J. E.,
Asst. Train Master,
P. & L. E. R. R. Co.,
Haselton, O.

Williamson, J. A., Jr.,
Drawing Instructor,
P. & L. E. R. R.,
Vance Street,
Coraopolis, Pa.

Wilson, J. T.,
President, American
Balance Valve Co.,
Jersey Shore, Pa.

Wilson, R. F.,
Supervisor, P. R. R. Co.,
1716 Middle St.,
Sharpsburg, Pa.

Wilson, W. J.,
Engr., P. & L. E. R. R. Co.,
532 Chartiers Ave.,
McKees Rocks, Pa.

Wirell, Karl,
Draftsman, P. S. C. Co.,
15 East Montgomery St.,
N. S., Pittsburgh, Pa.

Winter, F. W.,
Patent Attorney,
1344 Oliver Building,
Pittsburgh, Pa.

Woernley, H. F.,
Asst. Chief Engineer,
W. A. B. Co.,
Wilmerding, Pa

Wolfe, L. L.,
care A. P. Hill Co.,
First National Bank Bldg.,
Pittsburgh, Pa.

Wolfersberger, S. C.,
Asst. Supt.,
B. & O. R. R. Co.,
So. Main Cross St.,
Somerset, Pa.

Woodside, S. P.,
General Freight Agent,
Wabash-Pittsburgh Ter. Ry.,
425 Wabash Bldg.,
Pittsburgh, Pa.

Wright, C. W.,
Sec'y. Steel Car Forge Co.,
1127 Frick Bldg.,
Pittsburgh, Pa

Wright, John B.,
Ass't. to Vice President,
W. A. B. Co.,
Wilmerding, Pa

Wright, R. V.,
Managing Editor,
Railway Age Gazette,
Woolworth Bldg.,
New York, N. Y

Wyke, J. W.,
Traveling Engr., Union R. R.,
2223 Manor Ave.,
Swissvale, Pa.

Yohe, J. B.,
General Manager,
P. & L. E. R. R. Co.,
General Office,
Pittsburgh, Pa.

Yungbluth, B. J.,
Gen'l Storekeeper,
Pgh. Rys. Co.,
7413 Monticello St.,
Pittsburgh, Pa

Yungman, Edgar.
Asst. Genl. Pass'r Agent,
Penna. R. R.,
Broad St. Station,
Philadelphia, Pa.

Zimmerman, Sam'l,
Gang Foreman Car Dept.,
P. & L. E. R. R.,
554 Russellwood Ave.,
McKees Rocks, Pa.

Zortman, C. E.,
Division Engr., P. R. R.,
1003 Penn Ave.,
Pittsburgh, Pa.

CONSTITUTION

ARTICLE I.

The name of this organization shall be "The Railway Club of Pittsburgh."

ARTICLE II.

OBJECTS.

The objects of this Club shall be mutual intercourse for the acquirement of knowledge, by reports and discussion, for the improvement of railway operation, construction, maintenance and equipment, and to bring into closer relationship men employed in railway work and kindred interests.

ARTICLE III.

MEMBERSHIP.

Section 1. The membership of this Club shall consist of persons interested in any department of railway service or kindred interests, or persons recommended by the Executive Committee upon the payment of the annual dues for the current year.

Sec. 2. Persons may become honorary members of this Club by a unanimous vote of all members present at any of its regular meetings, and shall be entitled to all the privileges of membership and not be subject to the payment of dues or assessments.

ARTICLE IV.

OFFICERS

The officers of this Club shall consist of a President, First Vice-President, Second Vice-President, Secretary, Treasurer, Finance Committee consisting of five members, Membership Committee consisting of seven members, Entertainment Committee consisting of three members, and an Elective Executive Committee of three or more members who shall serve a term of one year from the date of their election, unless a vacancy occurs, in which case a successor shall be elected to fill the unexpired term.

ARTICLE V.

DUTIES OF OFFICERS

SECTION 1. The President shall preside at all regular or special meetings of the Club and perform all duties pertaining to a presiding officer; also serve as a member of the Executive Committee.

SEC. 2. The First Vice-President, in the absence of the President, will perform all the duties of that officer; the Second Vice-President, in the absence of the President and First Vice-President, will perform the duties of the presiding officer. The First and Second Vice-President shall also serve as members of the Executive Committee.

SEC. 3. The Secretary will attend all meetings of the Club or Executive Committee, keep full minutes of their proceedings, preserve the records and documents of the Club, accept and turn over all moneys received to the Treasurer at least once a month, draw cheques for all bills presented when approved by a majority of the Executive Committee present at any meetings of the Club, or Executive Committee meeting. He shall have charge of the publication of the Club Proceedings and perform other routine work pertaining to the business affairs of the Club under the direction of the Executive Committee.

SEC. 4. The Treasurer shall receipt for all moneys received from the Secretary, and deposit the same in the name of the Club within thirty days in a bank approved by the Executive Committee. All disbursements of the funds of the Club shall be by cheque signed by the Secretary and Treasurer.

SEC. 5. The Executive Committee will exercise a general supervision over the affairs of the Club and authorize all expenditures of its funds. The elective members of this Committee shall also perform the duties of an auditing committee to audit the accounts of the Club at the close of a term or at any time necessary to do so.

SEC. 6. The Finance Committee will have general supervision over the finances of the Club, and perform such duties as may be assigned then by the President or First and Second Vice-Presidents.

SEC. 7. The Membership Committee will perform such duties as may be assigned them by the President or First and

Second Vice-Presidents, and such other duties as may be proper for such a committee.

SEC. 8. The Entertainment Committee will perform such duties as may be assigned them by the President or First and Second Vice-Presidents and such other duties as may be proper for such a committee.

ARTICLE VI.

ELECTION OF OFFICERS.

SECTION 1. The officers shall be elected at the regular annual meeting as follows, except as otherwise provided for:

SEC. 2. Printed forms will be mailed to all the members of the Club, not less than twenty days previous to the annual meeting, by the elective members of the Executive Committee. These forms shall provide a method, so that each member may express his choice for the several offices to be filled.

SEC. 3. The elective members of the Executive Committee will present to the President the names of the members receiving the highest number of votes for each office, together with the number of votes received.

SEC. 4. The President will announce the result of the ballot and declare the election.

SEC. 5. Should two or more members receive the same number of votes, it shall be decided by a vote of the members present, by ballot.

ARTICLE VII.

AMENDMENTS.

Amendments may be made to this Constitution by written request of ten members, presented at a regular meeting and decided by a two-thirds vote of the members present at the next regular meeting.

BY-LAWS

ARTICLE I.

MEETINGS.

SECTION 1. The regular meetings of the Club shall be held at Pittsburgh, Pa., on the fourth Friday of each month, except June, July and August, at 8:00 o'clock P. M.

SEC. 2. The annual meeting shall be held on the fourth Friday of October each year.

SEC. 3. The President may, at such times as he deems expedient, or upon request of a quorum, call special meetings.

ARTICLE II.

QUORUM.

At any regular or special meeting nine members shall constitute a quorum.

ARTICLE III.

DUES.

SECTION 1. The annual dues of members shall be Two dollars, One dollar of which to provide light refreshments for each meeting, payable in advance on or before the fourth Friday of September each year.

SEC. 2. The annual subscription to the printed proceedings of the Club shall be at the published price of One Dollar.

SEC. 3. At the annual meeting members whose dues are unpaid shall be dropped from the roll after due notice mailed them at least thirty days previous.

SEC. 4. Members suspended for non-payment of dues shall not be reinstated until all arrearages have been paid.

ARTICLE IV.

ORDER OF BUSINESS.

1—Roll call.
2—Reading of the minutes.
3—Announcements of new members.
4—Reports of Committees.
5—Communications, notices, etc.
6—Unfinished business.
7—New business.
8—Recess.
9—Discussion of subjects presented at previous meeting.
10—Appointment of committees.
11—Election of officers.
12—Announcements.
13—Financial reports or statements.
14—Adjournment.

ARTICLE V.

SUBJECTS—PUBLICATIONS.

SECTION 1. The Executive Committee will provide the papers or matter for discussion at each regular meeting.

SEC. 2. The proceedings or such portion as the Executive Committee may approve shall be published (standard size, 6x9 inches), and mailed to the members of the Club or other similar clubs with which exchange is made.

ARTICLE VI.

The stenographic report of the meetings will be confined to resolutions, motions and discussions of papers unless otherwise directed by the presiding officer.

ARTICLE VII.

AMENDMENTS.

These By-Laws may be amended by written request of ten members, presented at a regular meeting, and a two-thirds vote of the members present at the next meeting.

RAILWAY CLUB NOTES.

The following subjects were presented and discussed by the several Railway Clubs during the month of October, 1917, as noted below:

New York Railroad Club, Harry D. Vought, Secretary,
95 Liberty Street, New York, N. Y.

SUBJECT—"Conservation of Material" by M. K. Barnum.

New England Railroad Club, Wm. E. Cade, Jr., Secretary,
683 Atlantic Avenue, Boston, Mass.

SUBJECT—"The Freight Car—A Factor in Winning the War" by E. H. DeGroot, Jr.

Canadian Railway Club, James Powell, Secretary,
P. O. Box 7, St. Lambert, near Montreal, Can.

SUBJECT—"Locomotive Design and Construction from a Maintenance Standpoint" by W. H. Winterrowd.

Richmond Railway Club, F. O. Robinson, Sec'y, Richmond, Va.

SUBJECT—Unknown.

St. Louis Railway Club, B. W. Frauenthal, Secretary,
Union Station, St. Louis, Mo.

SUBJECT—"The Ability of Refrigerator Cars to Carry Perishable Products" by M. E. Pennington.

Southern & South Western Ry. Club, A. J. Merrill, Secretary,
Box 1205, Atlanta, Ga.

SUBJECT—Unknown.

Central Railway Club, Buffalo, N. Y., Harry D. Vought,
Secretary, 95 Liberty Street, New York, N. Y.

SUBJECT—No Meeting.

The Railway Club of Pittsburgh, J. B. Anderson, Secretary,
207 Penna. Station, Pittsburgh, Pa.

SUBJECT—Annual Meeting.

Copies of the above papers can be had upon application to the Secretary at the address given for a nominal price.

INDEX — VOL. XVI.

—A— Page

Anthony, J. T., Paper by 87
A General Survey of the Mechanics of the Chilled Iron Car Wheel 210
Ammunition Problems in War Time 298
Annual Meeting 322
Annual Report of the Secretary 327
Annual Report of the Treasurer 329

—B—

Buell, D. C., Paper by 52
By-Laws 381

—C—

Car Wheel, Chilled Iron 210
Constitution 379

—D—

Discussion on Papers:
- Operation of Transportation Facilities and Manufacturing Activities in the Verdun Region—Remarks on 30
- Freak Patents 38
- The Man Problem 67
- The Effect of Fire-box Design Upon Boiler Capacity and Economy 113
- Telautograph As Used in Railway Service 170
- Wanted—A Freight Car 192
- Chilled Iron Car Wheel—General Survey of Mechanics 285
- Ammunition Problems in War Time 319

—E—

Election of Officers 230
Entertainment — Annual 334

—F—

Freak Patents 38
Flannery, J. Rogers — Address 128
Freight Car — Wanted 180

—H—

Humphrey, A. L. — Paper by 298

—I—

Index of Papers and Their Authors — Railway Clubs 323

—K—

Kleine, R. L., Paper by 130

—L—

Law — What Is It 172
Lyndon, Geo. W., Paper by 210

—M—

Memoriam — U. G. Detwiler 85
- G. E. Trautwein 295
- Laurence W. Frank 330
- Harry L. Allen 330
- James J. Duer 389

Members — List of 337

—N—

Nomination of Officers.................................... 295

—O—

Observations—Operation of Transportation Facilities and Manufacturing Activities in the VerdunRegion........ 8
Officers — Nomination of 295
Officers — Election of 330

—P—

Penton, John A., Paper by.................................. 8
Papers and their Authors, presented before different Railway Clubs during the season of 1916-1917, Index of........... 325
Presentation of Testimonial to retiring President, J. G. Code... 333

—R—

Red Cross Organization — J. Rogers Flannery................. 128
Report of Committee on Revision of M. C. B. Rules of Interchange 130
Roll of Honor — Resolution.................................. 297
Remarks of Officers elect................................... 331
Roll of Honor — Members..................................... 320

—S—

Swearingen, Hon. Joseph M., Address......................... 172
Schoyer, A. M., Paper by.................................... 180
Secretary's Annual Report.................................... 327
Statement of Ownership, management, circulation, etc.......... 335

—T—

Turner, Walter V., Paper by.................................. 38
The Man Problem... 52
The Effect of Fire Box Design upon Boiler Capacity and Economy 87
Telautograph as used in Railway Service...................... 156
Treasurer's Annual Report.................................... 329

—V—

Vial, F. K., Paper by.. 210

—W—

Wanted — A Freight Car....................................... 180

—Z—

Zafra, Carlos de, Paper by.................................... 156

In Memoriam

JAMES J. DUER

Died, October 6, 1917

THE PENN COUPLER

Our latest development of the M. C. B. Coupler, a modification of our popular Pitt and Janney X Couplers, with latest Improvements.

LOCK-TO-THE-LOCK,

LOCK-SET, and KNUCKLE-OPENER.

Send for blue prints and prices.

—MANUFACTURED ONLY BY—

THE McCONWAY & TORLEY CO.,
PITTSBURGH, PA.

Our Best Salesman!

Any of the over FORTY Railroad Systems in the United States using our STREET STOKERS and MECHANICAL COAL PUSHERS.

LOCOMOTIVE STOKER CO.

General Office and Works
PITTSBURGH

50 Church Street
NEW YORK CITY

Railway Exchange
CHICAGO

PINTSCH MANTLE LIGHT

The system that has made good wherever it has been applied . . . .

SAFETY ELECTRIC LIGHT

Type "F" regulation ensures constant lamp voltage and long lamp life .

The Safety Car Heating & Lighting Co.

Chicago, Philadelphia, Washington, Boston,
St. Louis, San Francisco, Montreal

2 Rector St., New York

KING METALLIC PACKINGS

for Locomotive Piston Rods, Valve Stems & Air Pumps

SECURITY WRIST PIN
LEACH SANDERS
GOLLMAR BELL RINGER
INDESTRUCTIBLE OIL CUP
BRAIDED SWAB, ETC.

The U. S. Metallic Packing Co.
PHILADELPHIA

This Space For Sale

RAILWAY STEEL-SPRING COMPANY,

Springs,
Steel Tired Wheels,
Locomotive and Car Wheel Tires.

GENERAL OFFICE, 30 CHURCH STREET, NEW YORK
BRANCH OFFICES:—CHICAGO, ST. LOUIS, ST. PAUL, WASHINGTON, D. C.

Building Bigger Business by Better Methods.

WHEN you cut down manufacturing costs—up go your PROFITS. When you increase your production—when you increase the QUALITY of your products—When you decrease spoilage—up go your profits. When you make it easier for an employee to produce more you make it easier for him to *earn* more; and you find it easier to get the *better kind* of help and easier to *keep* them. And up go your profits.

When you cut down your power costs when you cut down maintenance of plant—when you reduce overhead supervision—when you lessen breakage of machinery—when you reduce stoppage of machinery—these mean MORE PROFITS.

These advantages and a greatly increased capacity for service to your customers come to plants equipped with G-E MOTOR DRIVE.

We will gladly send a member of our Engineering Organization who will study the requirements and conditions of your plant, and tell you HOW, WHERE and WHY G-E MOTOR DRIVE will give you manufacturing advantages.

General Electric Company

GENERAL OFFICE:
SCHENECTADY, N. Y.

SALES OFFICES
IN ALL LARGE CITIES

7000

STANDARD STEEL CAR COMPANY

OFFICES { General Offices: Frick Bldg., PITTSBURGH, PA.
NEW YORK: 170 Broadway
CHICAGO: Fisher Building

WORKS { BUTLER, PA.
NEW CASTLE, PA.
HAMMOND, IND.

STEEL AND COMPOSITE

FREIGHT CARS

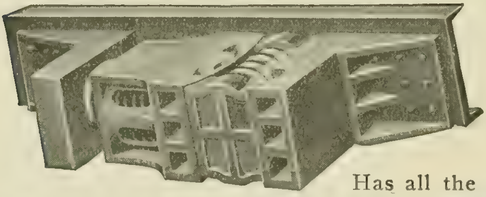
For all Classes of Service, from our Standard Designs,
or according to Specifications of Purchasers.

Steel Car Underframes

TRUCKS, BOLSTERS, BRAKE BEAMS, ETC.

Capacity 50,000 Cars per Annum

INQUIRIES SOLICITED



USE BUTLER DRAFT GEARS

FRICTION RIGGING

PIPER PATENTS

200,000 lbs. Capacity.

Has all the points of a Perfect Gear.

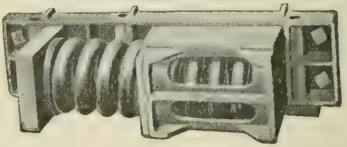
TANDEM SPRING ATTACHMENTS

6¼x8 or 8x8 DRAFT SPRINGS

PERFECT SPRING PROTECTION

Butler Drawbar Attachment Co.

Send for Catalog CLEVELAND, OHIO



SCHAEFER

DROP-FORGED

FOUNDATION BRAKE GEAR DETAILS,

COMBINE

MORE STRENGTH WITH LESS WEIGHT

Schaefer Equipment Company

Oliver Building Pittsburgh, Pa.

STANDARD STEEL PLATFORMS
ARE IN USE BY 281 COMPANIES

SESSIONS—STANDARD FRICTION DRAFT GEARS
ARE IN USE BY 205 COMPANIES

—BOTH MADE BY—

THE STANDARD COUPLER CO.

CHICAGO: People's Gas Building NEW YORK: 30 Church St.

J-M RAILROAD SUPPLIES

Roofings
Packings
Gaskets
Pipe Coverings
Hair Felt
Smoke Jacks
Asbetos Wood
Waterproofing
Corks
Fibre Conduit
Locomotive Lagging
Flexible Armored Squirt, Tank, Car Heating, Air Brake and Air Signal Hose
Air Brake Expander Ring
Steel Car Insulation
Underground Conduit
Asbestos Cements
Brake Lining and Blocks
Electrical Supplies
Mastic Flooring
Speedometers
Fire Extinguishers
Manual Slack Take Up for Air Brakes
Vitribestos Stack Lining
Refrigerator Car Insulation

Write for Catalogs

H. W. JOHNS-MANVILLE COMPANY
NEW YORK CITY
Branches in 54 Large Cities

Union Steel Casting Company,

PITTSBURGH, PA.

Steel Cast Locomotive Frames, Driving Wheel Centers, and Miscellaneous Locomotive Castings.

Vanadium Steel Castings a Specialty

VAPOR CAR HEATING CO., Inc.

RAILWAY EXCHANGE CHICAGO

Successors to

Chicago Car Heating Co.

Standard Heat & Ventilation Co., Inc.

NEW YORK
30 Church
WASHINGTON, D. C.
Munsey Bldg.

Montreal,
Que.

BOSTON, MASS.,
53 State Street
ATLANTA, GA.,
Candler Bldg.

Freight and Passenger

CARS

Of Every Description

Pressed Steel Specialties

Pressed Steel Car Company

New York Pittsburgh Chicago St. Paul
Washington, D. C.

FOR

GREATER EFFICIENCY

USE

DAVIS **SOLID-TRUSS** BRAKE BEAMS

FOR

Freight and Passenger Equipment.

ALSO

Pressed Steel Journal Box Lids.

DAVIS BRAKE BEAM CO.,

JOHNSTOWN, PA.

FRANK J. LANAHAN, Pres. CHAS. J. GRAHAM, Vice-Pres. GEO. W. FOX, Secretary

STUCKI

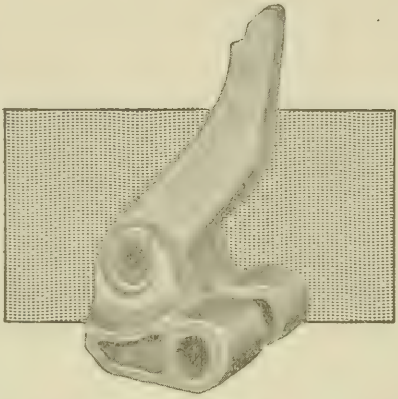
Side Bearings

SAVE WHEELS, RAILS, POWER

AVOID DERAILMENTS

A. Stucki Co.
Oliver Building
PITTSBURGH,
PA.

This Space For Sale



For Those "Break-In-Twos"

AVOID the delays and dangers in chaining up "break-in-twos" and setting out at the first siding. Take your trains right in to terminals coupled up with the Gilman-Brown Emergency Knuckle.

Fits practically all types of M. C. B. couplers with a *close* and *normal* coupling—even where one pin lug is broken from the draw head; air line can be safely coupled up and maintained without dummy hose.

For more than ten years the standard repair knuckle on the leading railways of the country, is your assurance of its economy and dependability.

Let us tell you more about this time saver.
Write for literature.

The Q AND G Co.

NEW YORK
90 West Street

ST. LOUIS
Railway Exchange Bldg.

CHICAGO
Peoples' Gas Bldg.

GILMAN-BROWN
Emergency Knuckle

SUYDAM'S Protective PAINTS
For Freight Cars and Structural Steel Work
—MANUFACTURED BY—
M. B. SUYDAM COMPANY,
OFFICE AND WORKS, 61ST AND BUTLER STS.,
BELL 'PHONE, 343 FISK. PITTSBURGH, PA.

This Space For Sale.

FOR SALE

CARNEGIE LIBRARY OF PITTSBURGH
3 1812 04298 4089